Effect of meditation on our biology

This article is an introductory summary of the teachings of Zen Master Thích Thông Triệt on the topic, mainly based on the oral teaching of Bhikkhuni Zen Master Thích Nữ Triệt Như given for the Fundamental Meditation Course. For a comprehensive in-depth understanding, the reader is encouraged to attend the complete nine-seminar teaching program and read the writings of Master Thích Thông Triệt that are being progressively translated into English.

Summary

A correct meditation practice triggers a beneficial chain reaction from the wordless awareness mind to the central nervous system, to the parasympathetic nervous system and to the endocrine system. The result is a healthy body, a peaceful mind, a body and mind in harmony, spiritual wisdom bursting forth and benevolence, compassion, empathetic joy and equanimity emerging. On the other hand, when we practice meditation incorrectly, we use the verbal knowing that comes from the thinking mind, intellect and consciousness. Under this process, we differentiate, compare, make an effort, pay attention, feel emotions and get attached. This impacts the central nervous system, the sympathetic nervous system and the endocrine system. Bodily functions are disturbed, the mind becomes anxious and confused, spiritual wisdom does not burst forth and benevolence, compassion, empathetic joy and equanimity do not develop.

Relationship between the awakened mind, spiritual teachings and the brain

When we practice meditation, our brain reacts to signals from the mind, and, in turn, the brain impacts on the body. We start our meditation practice with an intention, for example by saying to ourselves: “I will practice ultimate seeing. I will start my walking meditation. I will do my sitting meditation”. We are using our mind to enunciate an intention to practice, or more accurately, we are using our awakened intellect to start our meditation practice. When our intellect is awakened to spirituality, we feel the motivation to practice meditation regularly and want to persist with the practice even though we may initially experience some difficulties. When we practice, we also determine what method and whose method we are following. We choose the correct method, the correct technique. This is why the awakened intellect plays a very important role.

We have chosen to follow the path laid out by the Buddha. The Buddha taught us four meditation practices: anupassanā meditation, samatha meditation, samādhi meditation and paññā meditation. The techniques and practical actions that we use – such as relaxing the tongue, looking in specific ways, listening to the bell, breathing through the nose – all have an impact on the brain. If we maintain our wordless awareness, we activate the wordless awareness mind located in the left rear hemisphere of the brain. In this area are located ultimate seeing in the occipital lobe, ultimate touch in the parietal lobe and ultimate hearing in the temporal lobe. There is also ultimate cognition located near the parietal lobe.

At the same time, both centripetal and centrifugal signals are exchanged with the limbic system.

The limbic system

The largest brain structure in the limbic system is the thalamus. The main function of the thalamus is to receive signals from the sense organs and distribute them to other areas of the brain for processing. For example, when we see in wordless awareness, the signal is transmitted by the thalamus to ultimate seeing. When we hear in wordless awareness, the thalamus transmits the signal to ultimate hearing. When emotions are involved in our perception, the thalamus sends signals to working memory and long term memory areas located in the pre-frontal cortex.

Below the thalamus is the hypothalamus. The hypothalamus fulfills a very important function because it is where our states of mind – such as tranquility, anger, sadness, sorrow, envy, loathing, greed etc. – are formed.

The role of the hypothalamus in our physiology is to maintain homeostasis. It links the nervous system and the endocrine system. It secretes neurohormones that act to up-regulate or down-regulate the release of other hormones. It is also closely linked to the automatic nervous system.

The endocrine system consists of two types of glands, those that are located inside the brain and those located in the body. Inside the brain are three endocrine glands: the pineal gland, the hypothalamus, and the pituitary gland. When we practice the technique of looking at the sunlight, the signal gets to the thalamus then onto the pineal gland. The pineal gland then releases the hormoe melatonin.

The hypothalamus is itself an important endocrine gland and is often called the master gland. It secretes several hormones

including melatonin. When we practice the technique of looking at darkness, the signal goes to the hypothalamus. There it activates the secretion of melatonin, which helps alleviate insomnia, prevent tumors (especially in the chest and the brain) and strengthen the immune system.

Immediately below the hypothalamus is the pituitary gland. It helps transmit signals from the hypothalamus to other endocrine glands.

Inside the body, there are a number of endocrine glands such as the thyroid gland, the parathyroid gland, the thymus (which controls the immune system), the adrenal glands, the pancreas, the reproductive glands, the salivary glands, etc.

Also, forming part of the limbic system are memory structures, in particular the hippocampus involved with long term memory and the amygdala with emotional memory. The long-term memory stores everything about events that we have experienced in the past. The emotional memory stores past negative emotions like fear and hate, as well as more positive emotions like pleasure and passion. In particular, it stores the strong, violent emotions like jealousy, hate or what Buddhism calls underlying tendencies. It can trigger instinctive and explosive reactions such as pulling a gun to shoot an enemy without taking the time to think of consequences. The amygdala is a small, almond-shaped structure. It is where emotional actions originate; it is where evil karma is generated.

Another form of memory is the working memory located in the frontal lobe of the brain. This is where images, sounds, numbers, concepts and words are kept in our consciousness for a short period of time to allow us to perform certain tasks. For example, when we want to dial a telephone number, the digits are brought up in the working memory to allow us to perform the task. Likewise, when we perform mental calculations, we keep all the numbers, intermediate results and calculation processes in working memory.

Everything that we do, say, think, perceive and feel in our daily life is automatically stored in memory.

Wordless awareness mind

When we practice meditation correctly, we experience harmony within our body and mind, as well as spiritual wisdom. This spontaneous wisdom originates from the potential for enlightenment that is innate in our wordless awareness mind. It does not come from the learning of the thinking mind, intellect, and consciousness, which are located in the pre-frontal cortex and together constitute the worldly mind. The objective of meditation is to stay in wordless awareness so that our wordless awareness mind is activated. The wordless awareness mind will then have wonderful effects on our body, mind, and spiritual wisdom.

The wordless awareness mind is located in the rear left hemisphere of the brain. It has the faculty to apprehend all stimuli perceived by the senses without being influenced by emotions and the ego. When wordless awareness is present, the mind of the meditation practitioner becomes peaceful, pure, tranquil and serene. Emotions are absent and the intellect is not distorted. Wordless awareness has also an effect on the cortex, the hypothalamus, and the pituitary gland. The hypothalamus activates the parasympathetic system, and through the pituitary gland affects the endocrine system. Together, these systems release biochemicals that result in a healthy body and a peaceful mind.

The wordless awareness mind plays a critical role in resolving psychosomatic illnesses. When we live in wordless awareness, we are free from the stress, anxiety, anger, fear, and envy that come with being attached to objects. We experience a clear awareness of what is happening without being caught in the dualistic thinking of love and hate, right and wrong, evil and virtue.

Physiological Effect of a Correct Meditation Practice: the axis of wordless awareness – limbic system – hypothalamus – parasympathetic system – endocrine system – brainstem

When we practice meditation, a signal is sent to the limbic system. When it reaches the hypothalamus, it activates the autonomic nervous system. This system has nerves that connect to and influence our internal organs. It is called autonomic because it acts largely unconsciously and regulates bodily functions under the direction of the hypothalamus.

The autonomic nervous system has two branches: the sympathetic nervous system and the parasympathetic nervous system.

When we practice meditation correctly, we first relax the mind or relax our thoughts. This is an important factor in starting the biofeedback process that helps resolve our psychosomatic illnesses. Next, and more important, we must maintain our wordless awareness as this will activate the parasympathetic nervous system. The extremity of the parasympathetic nervous system releases the neurotransmitter acetylcholine that triggers a number of actions from the endocrine system.

For example, the release of insulin from the pancreas comes into balance, which helps regulate the amount of glucose in the blood by enabling the cells to absorb glucose and by storing any excess glucose in the tissues for future use. The hypothalamus also activates the brainstem, which releases acetylcholine, serotonin (like the pineal gland), melatonin (like the hypothalamus) and especially dopamine. The release of dopamine gives us an intrinsic feeling of pleasure and motivation not related to any external stimuli. The Buddha mentioned a feeling of elation, rapture and motivation in all the four stages of samādhi that he experienced leading to enlightenment.

Acetylcholine gives us a feeling of lightness and alertness. It also regulates our blood pressure, helps us feel awaked, improves our memory and learning, and develops our cognitive capacity. As the body feels at ease, we develop a feeling of serenity. The physical well-being in the body and the sense of serenity of mind, together with the positive impact of dopamine, result in a permanent state of joy and tranquility.

Melatonin is a hormone that regulates the biological clock in our brain. It regulates our states of sleep and wakefulness and helps cure insomnia and prevent cancer. It contributes to regulating our blood pressure and preventing cardiovascular diseases, blood clots in the brain and cataracts. Melatonin also helps strengthen the auto-immune system, improve memory and slow the onset of Alzheimer. Melatonin is secreted by the pineal gland and the hypothalamus.

When we practice meditation correctly, the hypothalamus releases acetylcholine and melatonin depending on the technique and practical actions that we use. These biochemicals that are produced in the brain affect our inner organs. When the parasympathetic system is activated, our cardiovascular system is regulated, our heart rate is steady, our blood pressure normalizes, our blood glucose level is balanced, and our digestive system operates optimally. This results in a healthy and balanced body.

Serotonin is an important neurotransmitter produced in the pineal gland. It helps improve our health and stamina, maintain our sleep/wake homeostasis, alleviate depression, provide a sense of satiety, regulate mental stresses and anxieties, and reduce headaches.

If we have been practicing meditation for a long while, but often find ourselves ill-tempered and do not experience benevolence, compassion, empathetic joy and equanimity, we should be aware that we are practicing incorrectly and are activating the sympathetic nervous system. The sympathetic nervous system secretes the biochemical norepinephrine that adversely affects the heart, the vascular system and other inner organs such as the stomach, liver, and kidneys. This is due to the link between the sympathetic nervous system and the endocrine system that directly affects the inner organs. For example, the inner medulla of the adrenal glands will produce more epinephrine and norepinephrine, whereas their outer cortex will produce cortisol, and the pancreas will produce glucagon. These biochemicals, when produced in excessive quantity, adversely affect our inner organs. They are released when we feel emotions such as sadness, despair, anxiety and fear, which come from the mind being attached to objects. Another cause that leads to their release is the incorrect practice of meditation. Techniques such as concentration, auto-suggestion and excessive effort lead to mental and psychosomatic illnesses.

It is the mind that creates illnesses in the body through the release of biochemicals by the sympathetic nervous system and the endocrine system. This mind is the false mind that is dominated by the ego, with its focus on “me” and “mine”. On the other hand, the wordless awareness mind is not influenced by emotions and the ego. In it, there is only a flow of wordless awareness. Zen Buddhism gives it a pseudo-entity and calls it “the boss” or the “true self”. When this flow of wordless awareness is present, the hypothalamus activates the parasympathetic nervous system, which secretes acetylcholine. This, in turn, leads to the release of a number of beneficial biochemicals, such as serotonin and melatonin from the pineal gland, and acetylcholine, serotonin, melatonin and dopamine from the brainstem.

The biofeedback process is a closed loop. When our intellect is awakened to spirituality, we start to practice meditation correctly, and this activates the parasympathetic nervous system and the endocrine system. These systems release biochemicals that regulate bodily functions and result in a healthy body. The mind perceives the wellbeing of the body and experiences peace and harmony. This, in turn, provides the feedback that motivates further practice.

Correct meditation practice, spiritual wisdom and the Four Immeasurable States

When we practice meditation correctly, we activate one of the four elements of the wordless awareness mind – ultimate seeing, ultimate hearing, ultimate touch and ultimate cognition – and, as a result, spiritual wisdom bursts forth. The word “spiritual” means that it relates to the wordless awareness mind or wordless cognitive awareness. Spiritual wisdom is the transcendental wisdom, beyond ordinary wisdom, which bursts forth when we successfully practice meditation. It results in novel and creative insights similar to the realizations experienced by the Buddha.

Spiritual wisdom differs from worldly knowledge. Worldly knowledge is learned at school and from life experiences. We use our thinking mind, intellect and consciousness to learn, remember and express it. However, this knowledge is often

accompanied by mental stress, sadness, anxiety, and sorrow.

On the other hand, when we activate the four elements of our wordless awareness mind, our Buddha nature, which is our potential for enlightenment, progressively emerges. This emergence is caused by our wordless awareness. This awareness does not come from learning or experiences. It is not old and stale, but is novel and creative. When it is present, entirely novel realizations spring up. They come from our Buddha nature or paññā wisdom.

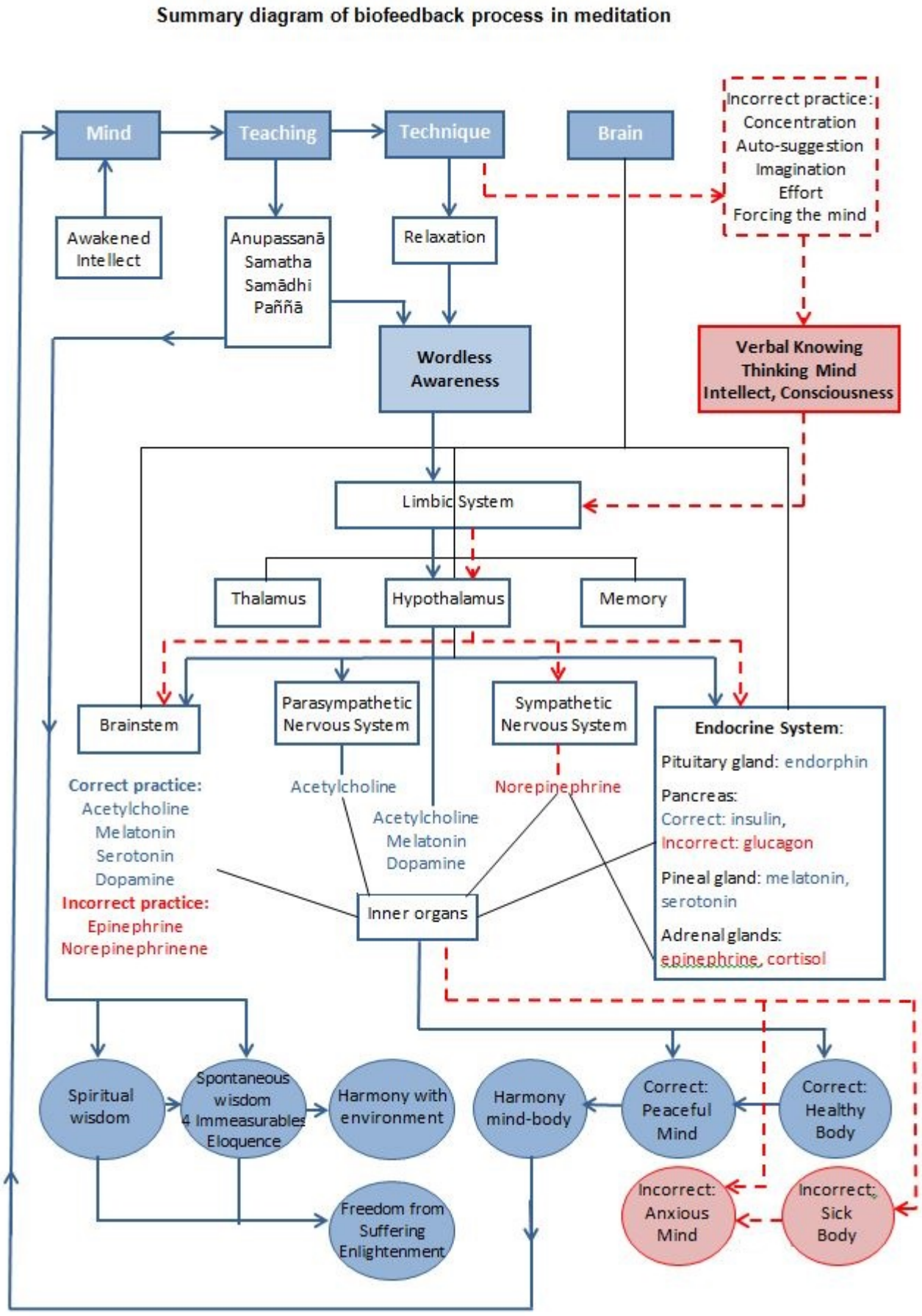
Spiritual wisdom manifests in several forms. At the first level, it is intuition, which is a direct, immediate knowledge that occurs without thinking, differentiation or reasoning. When our intuition is sharper, it becomes a transcendental intuition that is capable of seeing into the future and across space.

In addition, it is compassion that will first emerge, followed by benevolence, empathetic joy, and equanimity. These four virtues develop progressively to become immeasurable and infinite, and are called the Four Immeasurable States. They do not have boundaries or conditions and are not subject to thinking. Benevolence and compassion in their worldly meaning have limits, conditions and boundaries, as they still involve thinking and differentiation. The four immeasurable states radiate in the aura surrounding the practitioner. Anyone coming near such a person will feel a sense of tranquility and serenity.

Benevolence is the feeling of loving-kindness, friendliness, goodwill and tolerance towards others. Compassion is the feeling of deep sympathy for others, accompanied by a strong desire to help. Empathetic joy is the feeling of joy and happiness arising from seeing joy and happiness in others. Equanimity is the feeling of peace, tranquility, evenness of mind, impartiality, not being attracted and not pushing away in the face of any objects or events, gains or losses, honor or dishonor, praise or blame, pleasure or sorrow.

Spontaneous paññā wisdom also brings eloquence. The person is suddenly able to speak fluently, understand clearly every word and sentence, and can expound the dhamma without any obstacles.

A correct meditation practice has physical and physiological effects on the mind and body that keep them healthy, in harmony and free of illnesses. When the mind follows the correct teaching and applies the correct technique, it affects the brain and, through it, the whole body. A healthy body, in turn, results in a peaceful mind. This represents the mutual interaction between, on one hand, the mind, teaching, technique and brain and, on the other hand, the body, mind and spiritual wisdom.



Incorrect meditation practice

We practice meditation incorrectly when we use our thinking mind, intellect or consciousness, or in other words verbal knowing, located in the pre-frontal cortex. The pre-frontal cortex is activated when we use one of the following techniques:

concentration, imagination, auto-suggestion, talking silently in the mind, making an effort, not relaxing. When we practice incorrectly, a signal is sent to the limbic system starting with the hypothalamus and then onto the autonomic nervous system. But with the incorrect practice, the sympathetic nervous system is activated instead of the parasympathetic nervous system.

The extremity of the sympathetic nervous system releases the biochemical norepinephrine that has the effect of increasing blood pressure. When norepinephrine reaches the endocrine system, it generates a reaction in the adrenal glands located at the top of the kidneys. There, the inner medulla of the adrenal gland releases epinephrine, which has the effect of increasing the blood sugar level, as well as norepinephrine, albeit in lesser quantity than epinephrine. These two hormones contribute to the release of fatty acids that may result in obesity.

When epinephrine is released in excessive quantity, the upper cortex of the adrenal glands releases cortisol. Cortisol, when in low quantity strengthens the immune system, but it has the opposite effect when in excessive quantity. When it is in excessive quantity, it follows the blood stream to reach the brain, and there it damages cells in the hippocampus, resulting in memory loss.

When norepinephrine reaches the pancreas, it triggers the release of glucagon which has the effect of transforming glycogen in the tissues into sugar in the bloodstream. Glucagon and insulin have opposite effects. Insulin facilitates the transfer of glucose in the bloodstream into glycogen in the tissues, whereas glucagon facilitates the release of glycogen into sugar.

When norepinephrine reaches the brainstem, it triggers a further release of epinephrine and norepinephrine by the brainstem. Excessive levels of norepinephrine increase blood pressure, and excessive levels of epinephrine increase blood sugar. The result is an increase in fatty acids, increased obesity risks, loss of memory and increased risk of diabetes. Excessive levels of norepinephrine and epinephrine also have adverse effects on the inner organs, weakening the liver and kidneys, and disrupting heart rates and the digestive system, resulting in constipation or diarrhea.

These are psychosomatic illnesses that are caused by a disturbed mind. The cause of the disturbed mind comes from the false mind, made up of the thinking mind, intellect and consciousness, which always involves attachment, unfulfilled craving, and sorrow. Anxiety rises further when the practitioner feels that the meditation practice does not bring the expected results. Psychosomatic illnesses are all related. When we use our verbal knowing through the false mind under the influence of emotions, we often experience the following psychosomatic illnesses: high blood pressure, high cholesterol level, high blood glucose level, forgetfulness, digestive problems, stomach ulcers, disturbed sleep, insomnia, irregular heart rates, liver problems, allergies, weak kidneys, delusions etc.

When our worldly mind is in operation, spiritual wisdom cannot emerge. The worldly mind never brings novel insights, nor benevolence, compassion, empathetic joy and equanimity. This is what ordinary people see as the madness in meditation practitioners who follow an incorrect practice.

Excessive activity of prefrontal cortex, negative emotions, and psychosomatic illnesses

People living in the world are often very busy with their work or business, or struggling to make ends meet. Their mind is often agitated, their pre-frontal cortex is in overdrive and they often experience stresses, irritations, frustrations, anxiety, and sorrow. In their case, the impact on the body is similar to when one follows an incorrect meditation practice. The sympathetic system is over-activated and harmful biochemicals are secreted in excessive quantity. This results in stress and illnesses such as cancer. Modern life is more stressful than life in earlier days and the sympathetic system gets over-activated as it is repeatedly bombarded by strong emotions. As a result, more people are now affected by psychosomatic illnesses than in earlier days when life was more leisurely and the sympathetic nervous system and the parasympathetic nervous systems were more in harmony. The sympathetic nervous system does not cause harm by itself. The sympathetic nervous system and the parasympathetic nervous system complement each other, and when they are in balance, the individual experiences good health.

Conclusion

Meditation helps bring a number of tangible benefits to the mind, body and spiritual development of the practitioner:

- transforming the mind
- improving physical and mental health
- balancing and bringing harmony to body and mind
- furthering harmony between the practitioner and the surrounding environment
- developing spiritual wisdom

These benefits are based on the biofeedback process involved in meditation. The practitioner needs to understand this process in order to make good progress in meditation and progress further on the spiritual path.