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Your Brain on Meditation

Benefits of Meditation for Spiritual & Physical Health

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In recent years, meditation has become incredibly trendy in the West, inspiring the production of documentaries, books, classes, and instructional YouTube channels. However, meditation has existed for thousands of years, with the earliest records dating back to 1500 BCE. Meditation formed an integral part of the Chinese Taoist and Indian Buddhist traditions and later spread to other parts of Asia and eventually to the West due to colonialism. Despite its long history and eventual widespread influence, an understanding of the neural mechanisms behind the benefits of meditation remained elusive until the late 20th century. With the advancement of technologies such as brain imaging, scientists can look at what is happening in the brain and body both during meditation and after months or even years of practice.

At its core, meditation is about sitting in mindful awareness, but it encompasses a wide range of practices and techniques that fall under the umbrella of meditation. "Mindfulness" is one practice related to connecting with the present and observing what is happening around us without affective reaction or attachment. Many forms of mindfulness meditation emphasize breathing as a

tool to reconnect with the present moment. Still, breath is not the only object of attention to which mindfulness can be applied. The primary goal of mindfulness meditation is to focus on a specific object of attention: the meditator's breath, bodily sensations, or the sounds and smells around them.

While science can offer insights into how and why meditation has such profound benefits, many different religious traditions have appreciated the spiritual power of meditation for thousands of years. According to Dr. Andrew Huberman of the Huberman Lab at Stanford, "There wasn't that much mechanistic understanding of how meditation works, but of course there was a deep understanding from cultures outside of the United States that meditation was extremely useful." Buddhist teachings surrounding meditation developed long before any scientific understanding of the nervous system or the effects of chronic stress on the body and mind. In Buddhism, meditation forms a core part of the "Way of Mindfulness," which, according to Nyanaponika Thera, a Buddhist monk, and scholar, is critical to liberation from suffering. He describes this liberation as "the highest goal of the Buddha's teaching," a goal that cannot be achieved without meditation. aut



Much of the rationale for meditation in spiritual traditions such as Buddhism has been validated by research into meditation's psychological and physiological benefits.

The systematic and scientific study of meditation was

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difficult to achieve until the late 20th century. While researchers could now measure behavioral changes, it was difficult to standardize, quantify, and authenticate the observed changes and establish a causal relationship, as is standard in scientific research underlies evidence-based practice. This was further complicated by the difficulty in determining what was happening at the neural level, which was only possible with technologies such as functional magnetic resonance imaging (fMRI). Neuroimaging techniques like fMRI allow researchers to determine activity in different parts of the brain with a high degree of accuracy. Even after developing these techniques, there was still the question of performing research in a noninvasive way to not disrupt meditation and potentially impact results. According to Robert Keith Wallace, "Investigators have reported difficulty in obtaining expert practitioners of meditation and in taking measurements in a way that did not interfere with the subjects' contemplative or concentrative efforts." Despite these limitations, studies have demonstrated meditation's psychological and physiological effects, especially as these techniques continue to evolve.

Both the acute or immediate and long-term effects of meditation have been subject to scientific study. Acutely, meditation has been shown to induce changes in both the cardiovascular and nervous systems. These changes can be observed during and immediately after meditation. In both novices and experienced practitioners, meditation reduces blood pressure and produces characteristic electroencephalography (EEG) changes. During meditation, there is also increased activation of the prefrontal cortex, the brain region responsible for executive functioning. Other research has documented the modulatory effects of the cardiovascular and respiratory systems on the autonomic nervous system. These immediate changes give insight into the calming effects of meditation on two body systems involved in the stress response.

The effects of short and long-term meditation practice have also been studied. Short-term meditation training of just

eight weeks caused a reduction in amygdala reactivity, a specific brain area associated with the stress response. Short-term training also led to increased connectivity between the amygdala and the ventromedial prefrontal cortex (VMPFC), a brain region implicated in emotion regulation. The heightened amygdala-VMPFC connection is a potential mechanism by which meditation produces salutary effects on emotion regulation ability. There is also evidence that meditation increased changes in white matter in the cingulate gyrus, which, like the amygdala, is part of the limbic system. The cingulate gyrus is associated with self-regulation, meaning that changes to this structure could have implications for interventions in mental disorders. Research suggests that the broad mechanism by which meditation induces positive changes is improved self-regulation, both in the short and long term; observed changes in these brain areas provide further evidence for this claim.

As a result of these benefits, meditation has become widely used in medical and psychological therapies for stress-related physical and mental disorders. One study found that meditation was as effective as standard antidepressants in treating depression. Mindfulness meditation programs caused a reduction in the symptomatology of individuals with anxiety and panic disorders. Meditation has also been shown to reduce negative symptoms of schizophrenia, such as apathy, and cause an increase in positive emotions. Mindfulness-based stress reduction (MBSR) courses are now recommended as a therapeutic intervention for many with debilitating stress due to chronic pain or other conditions.

For thousands of years, meditation has been used to

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alleviate suffering, and the development of modern technology has confirmed its psychological and physiological benefits to our lives. Meditation has been shown to be an effective therapy for individuals struggling with mental health disorders. Still, it can be incredibly beneficial for anyone, whether they are struggling with mental health and other emotional concerns or not. Meditation practice is accessible to all and can be easily brought into your life. It can be as simple as sitting or lying down with a focus on your breathing. It can be just noticing the sights and sounds around you. It can be built into your daily routine: walking, brushing your teeth, or taking a shower can all be made into meditative practices. Meditation can be used as a tool to relieve stress resulting from any source, whether it is academic, social, or mental health struggles.