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# The role of mind-body practices in managing stress-related disorders

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### Abstract

Stress-related disorders have become increasingly prevalent due to modern-day lifestyle challenges, resulting in significant physiological and psychological health consequences. Mind-body practices (MBPs) such as meditation, yoga, tai chi, qigong, and biofeedback offer holistic approaches to managing these conditions. This paper reviews the mechanisms by which MBPs influence stress physiology, highlights clinical evidence of their efficacy, and discusses their potential integration into conventional healthcare. Emphasis is placed on the role of these interventions in regulating the autonomic nervous system, improving emotional resilience, and promoting overall well-being.

**Keywords:** Mind-body practices, stress-related disorders, meditation, yoga, tai chi, mindfulness, biofeedback, autonomic nervous system, resilience, complementary therapies

### Introduction

In the current era, chronic stress has become an unavoidable consequence of urbanization, sedentary lifestyle, and increasing psycho-social demands. The World Health Organization (WHO) recognizes stress as the “health epidemic of the 21st century” due to its association with anxiety, depression, cardiovascular ailments, and metabolic syndromes. While modern medicine approaches stress through pharmacological and psychotherapeutic means, these interventions often carry risks of side effects and limited long-term adherence.

The ancient Indian wisdom encoded in Ayurveda provides a holistic framework for understanding and managing stress-related ailments. According to Ayurveda, diseases are the result of *prajnāparādha* (intellectual blasphemy) or the misalignment of one’s actions, thoughts, and environment, disrupting *dosha* equilibrium (*vāta*, *pitta*, *kapha*) and *manas* (mind). As per *Charaka Samhita* (Sūtrasthāna 1/58), health is defined as a state where bodily humors, digestive fire, bodily tissues (*dhātus*), excretory processes, and mind-soul harmony are in equilibrium:

**"Samadoṣaḥ samāgnīśca samadhātu malakriyāḥ |  
Prasanna ātmendriya manāḥ svastha ityabhidhiyate ||"**

Mind-body practices (MBPs) like *dhyāna* (meditation), *prāṇāyāma* (breath regulation), *āsana* (posture), and *yoga nidrā* (yogic relaxation), which are integral to Ayurveda and allied systems such as Naturopathy and Yogic sciences, are increasingly supported by clinical evidence for their efficacy in modulating stress physiology. This paper presents a comprehensive review of the physiological and psychological mechanisms of MBPs, substantiated with Ayurvedic principles and supported by modern scientific validation

### Understanding Stress and Its Impact on Health

Stress (*Vega avarodha* or *Vega dharana*) is described in Ayurveda as a disturbance of mental and physical balance caused by suppression of natural urges or overwhelming external stimuli. The concept of *Manasika bhavas* (mental states) such as *chinta* (excessive thinking), *bhaya* (fear), and *krodha* (anger) directly influences the *doshas*, especially *vāta*, resulting in psychosomatic illnesses (*manasroga*).

As per *Ashtanga Hridayam* (Sūtrasthāna 1/23), mental diseases arise due to:

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**"Ātivāhyān manovikārān...kāyavikārapradān rasān ca"**

("Mental afflictions arising from excessive and unregulated thoughts eventually lead to somatic manifestations.")

From a physiological viewpoint, chronic stress overactivates the *HPA axis* and the *sympathetic nervous system*, increasing cortisol and catecholamine levels. Ayurveda equates this to the aggravation of *vāta dosha*, which governs movement and neural communication, leading to instability in bodily functions, including digestion (*agnimandya*), sleep (*nidranāsha*), and emotional balance (*rajas* and *tamas* predominance).

**Concept and Scope of Mind-Body Practices**

Mind-body practices are therapeutic interventions that leverage the mind's power to influence physiological functions. While these are now popularized in modern wellness settings, their origin can be traced back to the Vedas and Upanishads. For instance, the *Yajurveda* highlights:

**"Yogena cittasya padena vācām malām śārīrasya ca vaidyakena ||"**

(Through yoga, the impurities of the mind, speech, and body are cleansed — *Yajurveda* 40.8)

Ayurveda and Naturopathy both emphasize *svasthavṛtta* (healthy lifestyle), *dinacharya* (daily routine), and *ritucharya* (seasonal regimen), supported by yogic disciplines to maintain psycho-physiological balance. These practices involve *āsana* (posture), *prāṇāyāma* (breath control), *dhyāna* (meditation), *shuddhi kriyās* (cleansing techniques), and dietetic regulation, promoting restoration of *ojas* (vitality) and strengthening *manas* (mind).

Modern definitions now align these practices under Complementary and Integrative Health, focusing on regulating autonomic activity, enhancing neuroplasticity, and fostering emotional resilience.

**Structure of Action of Mind-Body Practices**

Mind-body practices (MBPs) function through a multidimensional structure of action that targets the psychophysiological mechanisms underlying stress responses. These practices work by re-establishing homeostasis within the body's regulatory systems, reducing hyperarousal of the stress-response network, and enhancing the individual's capacity for resilience and emotional regulation. The structure of action of MBPs can be understood by examining their effects on three interrelated levels: the autonomic nervous system (ANS), the hypothalamic-pituitary-adrenal (HPA) axis, and neuropsychological processes. Additionally, MBPs influence immune-inflammatory pathways and gene expression, which play crucial roles in stress-related disorders.

**1. Modulation of the Autonomic Nervous System**

(ANS): One of the primary mechanisms by which

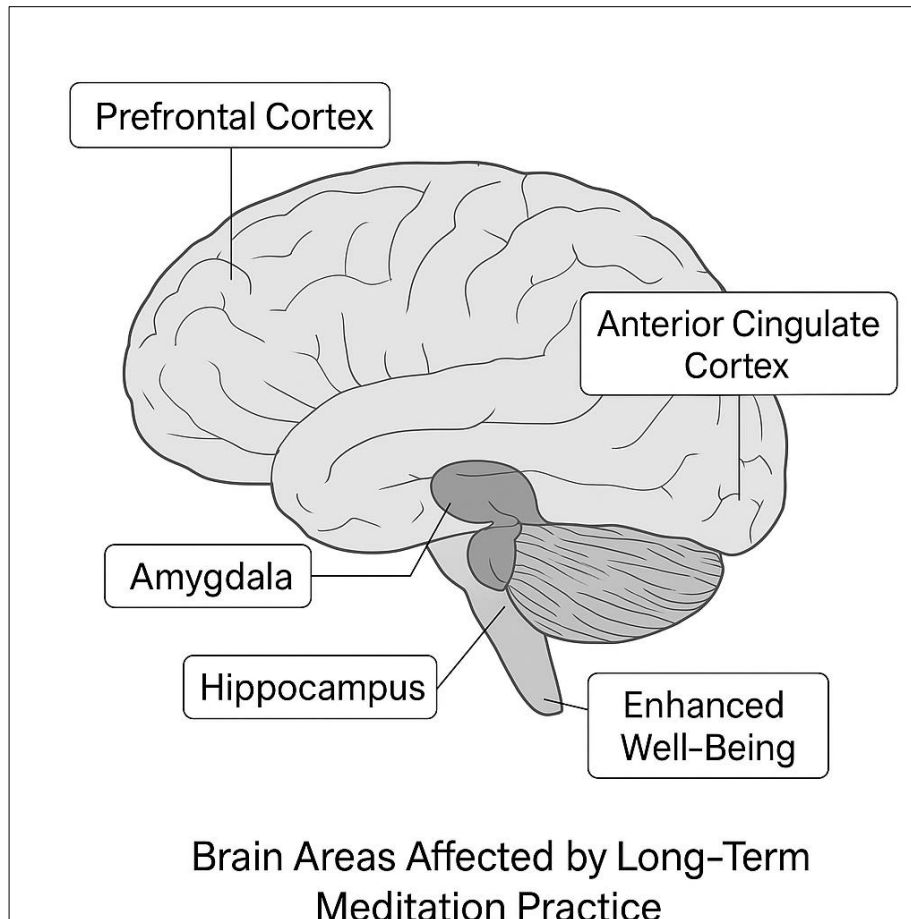
MBPs exert their therapeutic effects is through balancing the autonomic nervous system. Chronic stress often leads to a state of sympathetic overactivity, characterized by elevated heart rate, increased blood pressure, and heightened levels of circulating catecholamines (epinephrine and norepinephrine). This sympathetic dominance contributes to the "fight or flight" state that exacerbates anxiety, hypertension, and other stress-related disorders. Mind-body interventions such as mindfulness meditation, yoga, and tai chi shift the balance towards parasympathetic activation, commonly referred to as the "rest and digest" response. Studies have demonstrated that regular engagement in these practices leads to increased heart rate variability (HRV), an established marker of vagal tone and parasympathetic activity (Thayer & Lane, 2010) [17]. Higher HRV is associated with better emotional regulation, resilience, and reduced physiological stress reactivity. Through slow, controlled breathing, meditative focus, and gentle movement, MBPs promote a relaxation response, characterized by reduced heart rate, lower blood pressure, and decreased muscle tension. This physiological state counteracts the deleterious effects of chronic sympathetic arousal and helps restore autonomic balance.

**2. Regulation of the Hypothalamic-Pituitary-Adrenal**

**(HPA) Axis:** The HPA axis plays a central role in the body's response to stress. Activation of this axis leads to the secretion of corticotropin-releasing hormone (CRH), adrenocorticotropic hormone (ACTH), and subsequently cortisol from the adrenal glands. While cortisol is essential for acute stress adaptation, prolonged elevation can result in immune suppression, metabolic dysfunction, mood disorders, and cognitive impairment (McEwen, 1998) [12]. Mind-body practices have been shown to attenuate HPA axis hyperactivity. Regular meditation and yoga practice are associated with lower basal cortisol levels and a reduced cortisol awakening response (Matousek *et al.*, 2010) [11]. A study by Pascoe highlighted the significant cortisol-lowering effects of yoga, particularly in individuals with elevated stress levels. The reduction in cortisol not only alleviates physical symptoms but also improves emotional well-being and cognitive function.

**3. Neuroplasticity and Functional Brain Changes**

MBPs induce structural and functional changes in brain regions implicated in stress regulation, emotional processing, and cognitive control. Neuroimaging studies have demonstrated increased gray matter density in the prefrontal cortex, hippocampus, and anterior cingulate cortex among long-term meditators (Lazar *et al.*, 2005; Hölzel *et al.*, 2011) [10, 6]. These areas are responsible for executive function, emotional regulation, and memory consolidation—functions commonly impaired in stress-related disorders.



**Fig 1:** Brain Areas Affected by Long-Term Meditation Practice

Furthermore, MBPs have been shown to decrease activity in the amygdala, a brain region involved in fear processing and stress reactivity (Hölzel *et al.*, 2010) [6]. Reduced amygdala reactivity correlates with decreased emotional reactivity and improved resilience to stress. Functional connectivity between the prefrontal cortex and limbic system is enhanced, enabling better top-down regulation of negative emotions and stress responses.

**4. Immune System and Inflammatory Pathways:** Chronic stress is associated with elevated levels of pro-inflammatory cytokines, such as interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF- $\alpha$ ), and C-reactive protein (CRP), contributing to systemic inflammation and increased risk for chronic diseases (Black & Garbutt, 2002). Mind-body practices modulate the immune system by downregulating these pro-inflammatory markers.

A meta-analysis by Black and Slavich (2016) found that mindfulness meditation interventions reduced circulating levels of IL-6 and CRP, highlighting their role in mitigating inflammation. Yoga practices have also been linked to enhanced immune function and reduced inflammatory gene expression (Kiecolt-Glaser *et al.*, 2012) [9]. These immunomodulatory effects play a critical role in managing stress-related disorders that have an inflammatory component, including depression and cardiovascular disease.

**5. Epigenetic Modulation and Gene Expression:** Emerging research indicates that MBPs may exert effects at the molecular level by influencing gene expression and

epigenetic modifications. Practices such as meditation and yoga have been associated with changes in gene expression profiles related to stress responses, inflammation, and immune regulation. A notable study by Kaliman *et al.* (2014) found that a day of intensive mindfulness meditation reduced the expression of histone deacetylase genes (HDACs), which are involved in epigenetic regulation, and lowered levels of pro-inflammatory gene expression. These findings suggest that MBPs can produce rapid and beneficial effects at the level of gene expression, providing a potential mechanism for their long-term health benefits.

**6. Psychological and Behavioral Effects:** In addition to their physiological impact, MBPs promote psychological well-being by fostering self-awareness, emotional regulation, and cognitive flexibility. Practices such as mindfulness meditation cultivate a non-judgmental awareness of the present moment, reducing rumination and maladaptive thought patterns often associated with anxiety and depression (Kabat-Zinn, 1990). Regular engagement in MBPs enhances self-efficacy, perceived control, and coping skills. Participants often report improvements in mood, reductions in perceived stress, and a greater sense of purpose and meaning in life (Shapiro *et al.*, 2006). These psychological benefits contribute to enhanced resilience, enabling individuals to respond adaptively to life stressors.

#### **Clinical Evidence for Mind-Body Practices in Stress-Related Disorders**

Extensive clinical research has evaluated the efficacy of MBPs in managing stress-related disorders. Mindfulness-Based Stress Reduction (MBSR), developed by Jon Kabat-

Zinn, is one of the most widely studied interventions. A meta-analysis by Goyal *et al.* (2014) involving 47 randomized controlled trials (RCTs) found that mindfulness meditation programs significantly reduced anxiety, depression, and stress symptoms compared to control groups.

Yoga has demonstrated efficacy in reducing symptoms of anxiety and depression, improving sleep quality, and enhancing quality of life in individuals with stress-related disorders. A randomized trial by Cramer *et al.* (2013) found that yoga was as effective as standard exercise interventions in reducing depressive symptoms. Another study by Streeter *et al.* (2012) suggested that yoga practice increased gamma-aminobutyric acid (GABA) levels in the brain, contributing to improved mood and reduced anxiety.

Tai chi and qigong have also shown promising results. In a systematic review and meta-analysis by Wang *et al.* (2014), tai chi was found to reduce symptoms of depression and anxiety in both clinical and non-clinical populations. Qigong, combining movement, breath control, and meditation, has been shown to improve HRV, reduce cortisol, and enhance mood (Jahnke *et al.*, 2010).

Biofeedback, another evidence-based MBP, allows individuals to gain control over physiological functions such as heart rate, muscle tension, and skin temperature. Studies have demonstrated its effectiveness in reducing symptoms of anxiety, PTSD, and chronic pain (Tan *et al.*, 2009). Biofeedback-assisted relaxation therapy has also been shown to lower blood pressure in individuals with hypertension (Yucha & Montgomery, 2008).

### Integration of Mind-Body Practices into Healthcare

The integration of MBPs into conventional healthcare is gaining momentum as evidence accumulates regarding their safety, efficacy, and cost-effectiveness. Many healthcare institutions now offer MBPs as part of integrative medicine programs. These programs provide patients with comprehensive care that addresses physical, emotional, and spiritual dimensions of health.

For example, MBSR programs are offered in numerous hospitals and clinics to support patients with chronic pain, cancer, and mood disorders (Grossman *et al.*, 2004). Yoga therapy has been incorporated into cardiac rehabilitation programs to reduce stress and improve cardiovascular outcomes (Ornish *et al.*, 1998). Tai chi and qigong classes are commonly offered in community settings to promote balance, flexibility, and mental well-being, particularly among older adults.

Furthermore, workplace wellness initiatives have increasingly incorporated MBPs to address occupational stress, burnout, and absenteeism. Research indicates that mindfulness-based interventions in the workplace can enhance resilience, job satisfaction, and productivity (Hülshager *et al.*, 2013).

### Limitations and Future Directions

Despite the growing body of evidence supporting MBPs, several limitations warrant consideration. Methodological heterogeneity among studies, including variations in intervention duration, frequency, and delivery, poses challenges for standardizing practices and drawing definitive conclusions. Many studies rely on self-reported outcomes, which may introduce bias.

Adherence remains a challenge, as sustained practice is essential to derive long-term benefits. Efforts to enhance engagement through technological innovations, such as mobile applications and online platforms, are ongoing (Mani *et al.*, 2015).

Future research should focus on identifying biomarkers of treatment response, elucidating dose-response relationships, and conducting large-scale, multicenter trials with rigorous methodology. Additionally, culturally sensitive adaptations of MBPs are needed to increase accessibility and relevance for diverse populations.

### Conclusion

Mind-body practices offer a holistic, evidence-based approach to managing stress-related disorders. By addressing the complex interactions between psychological processes and physiological function, MBPs empower individuals to take an active role in their health and well-being. Integrating these practices into conventional healthcare can enhance the management of stress-related conditions, reduce reliance on pharmacological treatments, and promote resilience in the face of life's challenges. As the field of integrative medicine continues to evolve, MBPs are poised to play an increasingly important role in promoting global mental health and well-being.

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