

ORIGINAL ARTICLE

Physiological Effects of Mantra Yoga in Persons with Disabilities: A Review

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ABSTRACT

Background: Mantra Yoga, an ancient mind-body practice involving the repetitive chanting sacred sounds or phrases, has been associated with numerous physiological and psychological benefits. From the medieval age, Mantra yoga the repetition of sacred sounds, words, or phrases has gained attention as a low-cost, accessible mind-body practice.

Objective: To synthesise evidence on mantra yoga's Physiological and health benefits for people with disabilities, including neurodevelopmental and acquired neurological conditions.

Methods: Narrative review of experimental, clinical, and mechanistic studies on mantra/chanting practices and closely related mantra-based meditation, emphasising autonomic, neurophysiological, endocrine/immune, and cardiorespiratory outcomes.

Results: Converging evidence indicates that mantra practices enhance parasympathetic activity and heart rate variability (HRV), reduce sympathetic arousal and cortisol, modulate brain activity (greater alpha/theta power; network "quieting"), and improve respiration and blood pressure regulation. In disability populations, small trials and pilots report benefits for motor coordination and attention in cerebral palsy, behavioural regulation in ADHD, social/communication skills in autism, and cognitive/emotional functioning after traumatic brain injury and stroke.

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Conclusions: Mantra yoga shows promising psychophysiological mechanisms that may support rehabilitation and function in people with disabilities. Larger randomised trials with standardised protocols and biomarker/brain measures are warranted.

KEYWORDS

- Mantra yoga • Disabilities • Physiological • Heart rate variability • EEG
- Stress biomarkers

INTRODUCTION

Mantra Yoga is a spiritual and meditative discipline that centres on repeating sacred sounds, words, or phrases, referred to as *mantras*. The practice cultivates mental clarity, emotional stability, and spiritual awareness (Feuerstein, 2008).¹ With origins tracing back over 3,000 years to the Vedic traditions of India, mantra yoga was employed by sages (*rishis*) who are said to have perceived these sacred sounds during profound meditative states (Flood, 1996).² The mantras were considered divine revelations (*śruti*) and were preserved through oral transmission, becoming integral to spiritual practices aimed at transcending ordinary consciousness and achieving higher states of awareness (Harvey, 2013).³ Mantra yoga has gained attention as a potential adjunct therapy for people with disabilities. Emerging evidence suggests it may influence autonomic nervous system regulation, neuroplasticity, and stress physiology, supporting motor, cognitive, and emotional rehabilitation. Its accessibility and low cost strengthen its potential role in integrative disability care: improved autonomic regulation, enhanced brain activity patterns, and reduced stress biomarkers.

In recent decades, scientific interest in mantra yoga has grown, with researchers examining its biological underpinnings and therapeutic potential. Evidence indicates that mantra practices may modulate autonomic nervous system regulation, enhance brain activity, balance endocrine responses, and improve cardiovascular health (Bernardi *et al.*, 2001; Kalyani *et al.*, 2011).^{4&5} For individuals with disabilities who often experience elevated physiological stress, impaired attention, and altered neural functioning, mantra yoga presents a promising, non-invasive, and cost-effective adjunctive therapy (Telles & Nagarathna, 2016).⁶ By engaging both cognitive and

physiological processes, mantra repetition may support mental health, cognitive functioning, and overall well-being. This review, therefore, seeks to summarise current evidence on the biological mechanisms and potential health benefits of mantra yoga for people with disabilities. Disabilities often present with impaired motor function, attention deficits, autonomic dysregulation, and heightened stress responses, necessitating integrative and low-cost therapeutic strategies (WHO, 2011). Mantra yoga offers a non-invasive, accessible approach that can complement conventional therapies. The Gayatri Mantra is considered especially powerful due to its phonetic structure and rhythmic recitation, which can create resonance effects in the brain and body (Sharma, 2015; Telles *et al.*, 2017).^{7,8} Research suggests that mantra chanting influences neural oscillations, autonomic regulation, and psychophysiological balance (Bernardi *et al.*, 2001; Kalyani *et al.*, 2011).^{4,5} Students with disabilities frequently experience elevated stress, reduced focus, and altered neurocognitive functioning, making them particularly vulnerable to mental health challenges (Emerson, 2015; Chaddha *et al.*, 2022).^{9,10} Gayatri Mantra chanting as an intervention may help reduce stress, enhance attention, and improve cognitive performance in this population.

The Mahamrityuñjaya Mantra (MMM) (“*Tryambakam yajāmahe...*”) is widely regarded in the Vedic tradition for promoting healing, resilience, and longevity (Feuerstein, 2003; Sharma, 2015).^{11,7} Physiological research suggests that mantra practices can synchronise respiration, slow breathing rhythms toward ~0.1 Hz, and engage vagal pathways, thereby shifting autonomic balance toward parasympathetic dominance (Bernardi *et al.*, 2001; Kalyani *et al.*, 2011; Streeter *et al.*, 2012).^{4,5,13} Such autonomic nervous system modulation

has been linked with reduced stress and improved cognitive control. For students with disabilities who frequently experience heightened stress reactivity, attentional dysregulation, sleep disturbances, and sensory overload these neurophysiological shifts may translate into meaningful functional gains, including improvements in attention, working memory, and arousal regulation (Emerson, 2015; Chaddha *et al.*, 2022).^{9,10}

Disability, whether arising from congenital conditions, neurodevelopmental disorders, or acquired injuries, is often associated with a spectrum of challenges including impaired motor function, attentional difficulties, autonomic dysregulation, and heightened stress responses (WHO, 2011). Conventional rehabilitation approaches though effective are frequently limited by accessibility, costs, and the need for sustained engagement, especially in resource-constrained settings. Consequently, there is an urgent need for complementary and integrative therapies that are low-cost, inclusive, and capable of addressing both physiological and psychological dimensions of disability. This review aims to synthesise current evidence on the biological mechanisms and health benefits of mantra yoga in the context of disability. By integrating insights from neuroscience, psychophysiology, and clinical studies, the paper explores how mantra chanting may serve as a non-invasive, accessible therapeutic strategy. The ultimate objective is to highlight the potential of mantra yoga as a complementary intervention that bridges traditional wisdom with modern rehabilitation science, thereby improving quality of life and fostering holistic well-being for people with disabilities.

Biological Mechanisms of Mantra Yoga

Autonomic Nervous System Modulation

Chanting mantras particularly the sacred sound "OM" has been associated with enhanced parasympathetic activity and improved heart rate variability (HRV), both indicators of healthier autonomic balance (Bernardi *et al.*, 2001; Telles *et al.*, 2019).^{4,22} Research further suggests that slow, rhythmic chanting reduces sympathetic overactivity, inducing relaxation, lowering stress responses, and promoting psychophysiological regulation (Kalyani *et al.*, 2011; Sharma *et al.*, 2019).^{5,21} These findings highlight the role of mantra chanting as a

simple, non-invasive practice for fostering autonomic stability and emotional well-being.

Neurophysiological Effects

Neuroimaging and EEG studies have shown that repetitive mantra chanting induces significant changes in brainwave patterns, particularly by increasing alpha and theta activity, which are associated with relaxed alertness, internalised attention, and reduced cognitive noise (Kalyani *et al.*, 2011; Lagopoulos *et al.*, 2009).^{5,23} Such repetitive sound patterns facilitate cortical deactivation in mind-wandering regions, enhancing attentional control and promoting emotional regulation (Berkovich-Ohana *et al.*, 2015; Harne & Hiwale, 2018).^{24,25} These findings suggest that mantra chanting supports relaxation and improves cognitive efficiency and psychological well-being.

Endocrine and Stress Biomarkers

Mantra practices have been associated with significant reductions in salivary cortisol, the body's primary stress hormone, indicating a potential modulatory effect on the hypothalamic-pituitary-adrenal (HPA) axis (Jevning *et al.*, 1992; Telles *et al.*, 2015).^{27,29} Beyond cortisol regulation, preliminary findings suggest that mantra chanting may also influence additional biomarkers, including catecholamines and inflammatory cytokines, thereby contributing to improved stress adaptation and overall physiological homeostasis (Bhasin *et al.*, 2013; Pascoe *et al.*, 2017).^{26,28} These results highlight the potential of mantra yoga as a low-cost, non-pharmacological tool for psychophysiological regulation.

Cardiovascular and Respiratory Benefits

Rhythmic chanting has been shown to slow the respiratory rate, increase oxygen saturation, and induce favourable fluctuations in blood pressure, reflecting improved cardiorespiratory efficiency (Bernardi *et al.*, 2001; Harne & Hiwale, 2018).^{4,25} These effects are mediated through the synchronisation of breath and sound, which enhances vagal activity and promotes autonomic balance. Such cardiorespiratory benefits hold particular relevance for individuals with disabilities, who frequently present with comorbid cardiovascular risks or reduced autonomic flexibility (Telles *et al.*, 2011; Sharma *et al.*,

2019).^{31,21} By supporting cardiovascular stability and respiratory regulation, mantra chanting offers a simple, low-cost adjunctive practice to improve overall health outcomes.

Evidence in Disability Populations

Cerebral Palsy

Interventions that combine mantra chanting with yoga practices have demonstrated improvements in motor coordination, attention, and orientation skills among children with cerebral palsy (Nagarathna & Nagendra, 2014; Telles *et al.*, 2013).^{32,39} While much of the existing research emphasises functional outcomes rather than direct biological markers, these improvements point toward possible autonomic and neurophysiological mechanisms, including enhanced sensory-motor integration, reduced stress reactivity, and improved cognitive regulation. Such findings underscore the potential of mantra-based yoga interventions as complementary therapies for neurodevelopmental disabilities

Autism Spectrum Disorders

Preliminary evidence also suggests that yoga and mantra chanting may support children with autism by improving social interaction, communication, and emotional regulation (Koenig *et al.*, 2012; Radhakrishna, 2010).^{39,40} The repetitive, predictable structure of chanting provides sensory consistency, while breathing regulation may enhance parasympathetic tone and reduce anxiety. These effects could contribute to better adaptive functioning and reduced behavioural challenges.

These studies suggest that mantra yoga interventions serve as adjunct therapies for neurodevelopmental disorders, offering low-cost, non-invasive approaches to support motor, cognitive, and socio-emotional

development. While more rigorous randomised controlled trials with biomarker assessments are needed, the neurophysiological basis including improved autonomic balance, enhanced cortical connectivity, and reduced stress reactivity provides a strong rationale for further exploration.

Attention-Deficit Hyperactivity Disorder (ADHD)

Mantra-based yoga interventions, particularly those focusing on rhythmic sound repetition and breath regulation, have shown benefits for children with ADHD. Pilot studies suggest improvements in sustained attention, behavioural regulation, and classroom performance, with possible mechanisms involving reduced sympathetic arousal and enhanced prefrontal cortical activity (Umadevi *et al.*, 2013; Jensen & Kenny, 2004).^{42,43} Such practices may help reduce hyperactivity and impulsivity through self-regulation of arousal and attention networks.

Cognitive and Neurological Impairments

Adults with traumatic brain injury (TBI) or attention deficits have demonstrated improvements in focus, working memory, and overall cognitive performance following mantra meditation interventions (Oman *et al.*, 2008; Bédard *et al.*, 2014).^{45,44} Although the number of controlled studies remains limited, preliminary findings indicate promising effects on neurophysiological stabilisation, as reflected in EEG changes (increased alpha and theta activity) and heart rate variability (HRV) improvements, both of which suggest enhanced autonomic regulation and attentional control (Harne & Hiwale, 2018; Tang *et al.*, 2009).^{30,46} These findings provide an early foundation for considering mantra meditation as a complementary approach for cognitive rehabilitation in neurological conditions.

Study	Population	Intervention	Duration and Frequency	Physiological Outcomes	Effects
Kumar <i>et al.</i> , 2024	Children and adults with various disabilities	Mantra Yoga (OM, Gayatri)	4-8 weeks, daily sessions	HRV, stress biomarkers (cortisol), and EEG	Improved parasympathetic activity, reduced stress, enhanced alpha EEG activity
Anand <i>et al.</i> , 2022	Healthy & clinical populations (reference for mechanism)	OM chanting	5-10 min single session	HRV	Increased HRV, parasympathetic dominance

table cont.....

Study	Population	Intervention	Duration and Frequency	Physiological Outcomes	Effects
Lucini <i>et al.</i> , 2022	Healthy adults (physiological model)	Slow OM chanting	Single session	ECG-respiration-BP synchronisation	Cardiorespiratory oscillations at 0.1 Hz improved autonomic regulation
Sivaramakrishnan <i>et al.</i> , 2025	Children with cerebral palsy	Mantra + Yoga	6 weeks, three sessions/week	HRV, respiratory rate	Improved autonomic balance, slower respiration, functional gains in attention/orientation
Sharma <i>et al.</i> , 2022	Adults with chronic stress or mild cognitive impairment	Listening to OM chanting	Daily sessions for 2 weeks	HRV, stress markers	Increased parasympathetic tone, reduced cortisol levels
Autism Meditation Review, 2012	Children with ASD	Mantra-based meditation	Varies (pilot studies)	EEG, cortisol	Enhanced attention and social engagement; trend toward reduced HPA-axis hyperactivity
TBI / ADHD Pilot, 2019	Adults with attention deficits post-brain injury	Mantra meditation	4–6 weeks, 3–5 sessions/week	EEG, functional attention tests	Improved attention; EEG suggested stabilisation of cortical activity
Prospective study, 2024]	Young Athletes	GM chanting + meditation	3 months, regular practice	Cognitive function, anxiety, mental state	Improved attention, memory, reduced anxiety, and better MMSE scores
Gupta & Gupta (2019)	School Children (11–14 yrs)	GM chanting	16 weeks, daily practice	Cognitive function (memory)	Enhanced spatial & verbal memory
Bernardi <i>et al.</i> (2001)	Healthy Adults	GM chanting (with physiological monitoring)	Acute / session-based	Respiratory function, HR, baroreflex sensitivity	Improved respiration, HR regulation, and baroreflex sensitivity
Sharma <i>et al.</i> (2016)	Parkinson’s Patients	Listening to GM	12 weeks, regular listening	Sleep quality, stress markers, cardiovascular measures	Better sleep, stress reduction, improved memory, reduced BP & pulse rates
Telles <i>et al.</i> (1998)	Elderly Individuals	Mindfulness + GM	Intervention period (noted sessions)	Psychological (anxiety)	Significant anxiety reduction
Singh & Jain (2020)	Young Adults (22–28 yrs)	GM meditation	40 days, daily practice	Psychological well-being	Increased psychological capital, reduced psychological distress
Sharma, Moradhvaj Singh & Patra (2024)	College students (no specific disability)	Mahāmṛtyuñjaya Mantra chanting	12 weeks; 5 sessions/week	Cortisol (stress hormone)	Significant decrease in cortisol in the experimental group vs the control.

DISCUSSION

Current evidence, though limited, supports the notion that mantra yoga influences multiple biological pathways relevant to people with disabilities. The practice modulates the autonomic nervous system, enhances neurophysiological function, and reduces stress biomarkers. These mechanisms may underlie

observed improvements in attention, emotional regulation, and functional performance.

The therapeutic potential of mantra yoga for individuals with disabilities lies in its multifaceted impact on physiological, cognitive, and psychological domains. Heightened stress responses, impaired attention, autonomic dysregulation, and

comorbid cardiovascular or metabolic risks often accompany disabilities. Conventional interventions, while effective, may not fully address these interconnected challenges, highlighting the need for integrative, low-cost, and accessible approaches. Through the repetition of sacred sounds, Mantra yoga offers a non-invasive practice that can complement standard care. Mantra yoga provides a simple, non-invasive practice that may complement conventional therapies. The Gayatri Mantra, through its rhythmic and phonetic qualities, has been shown to influence neural oscillations and autonomic regulation, supporting stress reduction and improved attention (Sharma, 2015; Telles *et al.*, 2017; Bernardi *et al.*, 2001; Kalyani *et al.*, 2011).^{7,8,4,5} Similarly, the Mahamṛtyuñjaya Mantra (MMM) is traditionally associated with healing and resilience, with research suggesting its role in synchronising respiration, enhancing vagal activity, and promoting parasympathetic balance (Feuerstein, 2003; Streeter *et al.*, 2012).^{11&13} For students with disabilities, who often face stress reactivity and attentional difficulties, such physiological shifts may translate into better self-regulation, working memory, and cognitive performance (Emerson, 2015; Chaddha *et al.*, 2022).^{9,10} Overall, mantra chanting particularly Gayatri and MMM shows promise as a supportive approach for mental health and cognitive functioning in this population.

From a physiological perspective, chanting mantras such as “OM” has been shown to enhance parasympathetic activity, improve heart rate variability (HRV), and reduce sympathetic overactivity, thereby promoting autonomic stability (Bernardi *et al.*, 2001; Telles *et al.*, 2019).^{4,22} Such effects are critical for individuals with disabilities, many of whom exhibit reduced autonomic flexibility. Similarly, rhythmic chanting improves respiratory efficiency, increases oxygen saturation, and produces favourable fluctuations in blood pressure, contributing to cardiovascular resilience (Harne & Hiwale, 2018; Sharma *et al.*, 2019).^{25,21} These mechanisms position mantra yoga as a supportive strategy for reducing cardiometabolic risk in vulnerable populations.

Neurocognitively, neuroimaging and EEG studies demonstrate that mantra chanting enhances alpha and theta brainwave activity, supporting relaxed alertness, attentional

control, and reduced cognitive noise (Lagopoulos *et al.*, 2009; Berkovich-Ohana *et al.*, 2015).^{23,24} For individuals with disabilities particularly those with traumatic brain injury, cerebral palsy, or attention deficits such improvements translate into better focus, emotional regulation, and functional skills (Gupta *et al.*, 2004; Harne & Hiwale, 2018).^{46,29} These findings underscore the role of mantra practices in supporting neuroplasticity and compensating for attentional impairments.

At the psychoneuroendocrine level, mantra meditation has been linked to reduced cortisol levels, suggesting downregulation of the hypothalamic-pituitary-adrenal (HPA) axis and improved stress resilience (Jevning *et al.*, 1992).²⁶ Preliminary evidence also points to modulation of catecholamines and inflammatory cytokines, indicating broader effects on immune and systemic health (Bhasin *et al.*, 2013).²⁵ For people with disabilities, who frequently experience chronic stress and low-grade inflammation, such regulation may contribute to improved overall well-being.

Significantly, mantra yoga’s accessibility enhances its suitability for disabled populations. Unlike physically demanding therapies, chanting requires minimal physical effort, making it adaptable to individuals with motor impairments or limited mobility. Its non-invasive, low-cost nature supports feasibility in clinical and community rehabilitation settings.

Despite these promising outcomes, significant limitations remain. Current studies often involve small sample sizes, heterogeneous populations, and short-term interventions. Moreover, few investigations have directly targeted disabled groups, with most findings extrapolated from general populations. Future research must adopt rigorous, disability-specific protocols, employ standardised biomarkers (e.g., HRV, cortisol, EEG), and evaluate long-term outcomes to establish robust clinical guidelines.

In summary, mantra yoga holds substantial promise as an adjunctive therapy for people with disabilities, offering benefits across autonomic regulation, neurocognitive function, psychophysiological stability, and emotional well-being. By bridging ancient spiritual traditions with modern biomedical insights, mantra yoga emerges as a practical, inclusive, and holistic approach to enhancing health and quality of life in disabled populations.

CONCLUSION

This review highlights the growing evidence that mantra yoga (om mantra, gayatri mantra, mahamurtijany mantra) exerts significant effects on multiple biological systems, including the autonomic nervous system, neurocognitive processes, endocrine function, and cardiorespiratory regulation. Through enhanced parasympathetic activity, increased alpha and theta brainwave patterns, modulation of the hypothalamic-pituitary-adrenal (HPA) axis, and improved respiratory and cardiovascular efficiency, mantra chanting emerges as a non-invasive, low-cost therapeutic practice.

For individuals with disabilities who often present with heightened stress responses, attentional deficits, motor impairments, and comorbid health risks these benefits hold particular relevance. Mantra yoga (OM, GM, MMM) offers an accessible intervention that promotes relaxation and emotional stability, enhances cognitive functioning, supports physiological homeostasis, and improves overall quality of life.

While the current body of research provides compelling preliminary evidence, further studies are needed to strengthen clinical applications. Future investigations should prioritise well-designed randomised controlled trials, disability-specific cohorts, standardised biomarkers (e.g., HRV, cortisol, EEG), and long-term follow-ups. Such efforts will be crucial to establishing evidence-based guidelines for integrating mantra yoga into rehabilitation and therapeutic programs.

In conclusion, mantra yoga represents a promising complementary approach for people with disabilities, bridging ancient spiritual traditions with contemporary biomedical science. Addressing both physiological and psychological dimensions of health offers a holistic pathway to support resilience, autonomy, and well-being in disabled populations.

Limitations and Future Directions

Although findings suggest that mantra yoga has promising biological and therapeutic benefits, current evidence is limited by small sample sizes, heterogeneous populations, and a lack of disability-specific studies. Most research relies on subjective outcomes, with insufficient use of standardised biomarkers such as HRV, cortisol, or neuroimaging.

Future studies should include larger, well-designed randomised controlled trials focusing on different disability groups, employ standardised protocols, and integrate objective physiological and neurocognitive measures. Exploring long-term effects and practical implementation within rehabilitation programs will be essential to establish mantra yoga as a credible adjunct therapy for people with disabilities.

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