International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 03 | Mar 2026 www.irjet.net p-ISSN: 2395-0072
National Conference on "PRANAYAMA BHARAT-2026"
Organized by: Scientific Pranayama Foundation Trust® Mysuru, in collaboration with ATME College of Engineering, Mysuru.

"Sama Vritti Pranayama as a Mind–Body Intervention for Mental Health in the Modern Era: A Narrative Review"

Varun[1], Bindu Shridhar[2], Shivaprasad Shetty[3], Prashanth Shetty[4]

Varun, INTERN DOCTOR, SDM College of Naturopathy and Yogic Sciences, Ujire, Karnataka, India
Bindu Shridhar, RMO AND Professor, SDM College of Naturopathy and Yogic Sciences, Ujire, Karnataka, India
Shivaprasad Shetty, CMO AND DEAN, SDM College of Naturopathy and Yogic Sciences, Ujire, Karnataka, India
Prashanth Shetty, PRINCIPAL, SDM College of Naturopathy and Yogic Sciences, Ujire, Karnataka, India

---***---

Abstract- Sama Vritti Pranayama, which is commonly called Box Breathing, is an ancient form of yogic breathing that involves equal measures of Puraka (inhalation), Antara Kumbhaka (inner retention), Rechaka (exhalation), and Bahya Kumbhaka (outer retention). Classical yoga texts such as the Hatha Yoga Pradipika have described the importance of controlling the breath in the practice of yoga in order to calm the mind and regularise the flow of life energy. Modern scientific research has studied the benefits of Box Breathing in depth. Scientific studies have proven that Sama Vritti Pranayama has a positive effect on the nervous system, including heart rate variability and vagal tone. It has been used in various medical conditions, including stress, anxiety, depression, and resilience. It has been used in medical students, medical staff, soldiers, and patients with traumatic stress. It has been used in the management of post-traumatic stress disorder and chronic pain. This article has attempted to bridge the traditional yoga practice and the scientific study of the benefits of Sama Vritti Pranayama. It has been concluded that Sama Vritti Pranayama is a simple and effective form of yoga that has the potential to benefit the health of individuals in the present scenario.

Key Words: Sama Vritti, Box Breathing, Autonomic Nervous System, Heart Rate Variability, Stress Reduction, Sleep Quality, Chronic Pain, Cognitive Focus, Mental Health

INTRODUCTION:

Breathing practices have a prominent place in yogic philosophy, integrating the physical, mental, and spiritual aspects of a person. At the same time, these techniques directly affect the autonomic nervous system. Recent studies have shown that controlled slow breathing can have a positive effect on stress, anxiety, depression, sleep, and cognitive functions by stimulating parasympathetic activity, vagus tone, and heart rate variability. Sama Vritti Pranayama is one of the types of pranayama mentioned in the book "Light of Pranayama" by B.K.S. Iyengar. Sama Vritti Pranayama is also known by various names like box breathing, square breathing, and equal proportional breathing. Vritti means "action," "movement," "course of conduct," and "method." Sama means "equal," "identical," and "in the same manner." There are four parts of our breathing: Puraka (inhalation), Antara Kumbhaka (inner retention), Rechaka (exhalation), and Bahya Kumbhaka (outer retention)(1,2). The Hatha Yoga Pradipika (II.50-51) clearly indicates: "Caturbhir vayuh samyukto yatha syat sama-

vrttikah, caturbhir eva kartavyah pranayamah samahitah" – The pranayama in which the breath is regulated in four equal parts steadies the mind and balances prana(3). Similarly, Patanjali's Yoga Sutras (II.50) state: "Bahya-abhyantara-stambha-vrttir desa-kala-sankhyabhih paridrsto dirgha-suksmah" – The pranayama, consisting of the regulation of inhalation, exhalation, and retention by ratio, time, and number, becomes long and subtle(4). The above slokas clearly indicate the balance of the sympathetic and parasympathetic nervous systems. The contemporary application of Sama Vritti in the form of box breathing is practised in the armed forces, medicine, and corporate settings. Scientific studies have proven the effectiveness of Sama Vritti in managing stress hormones, resilience, sleep, and emotional stability(5,6). It has been observed that controlled breathing is beneficial in the recovery of pain, as it decreases sympathetic nervous responses(7). Thus, Sama Vritti Pranayama can be said to be a continuum of traditional wisdom and modern science, making this simple technique of box breathing an easy, simple, and scientifically supported technique for resilience, better mental health, and well-being in modern society.

BREATHING AND MENTAL HEALTH:

Mental disorders, including anxiety, depression, post-traumatic stress, and emotional difficulties, arise as a consequence of autonomic nervous system imbalances, with sympathetic dominance causing shallow, fast breathing, decreased HRV, and anxiety(8). Regulated, slow, conscious breathing normalises parasympathetic activity, increases HRV, and reduces stress markers(2). Scientific studies verify its efficacy in anxiety, depression, PTSD, and emotional problems (5,6,9). Ancient yogic texts also endorse these findings. The Hatha Yoga Pradipika II.50-51 states: "Caturbhir vayuh samyukto yatha syat sama-vrttikah…." Equal regulation of Puraka (inhalation), Antara Kumbhaka (inner retention), Rechaka (exhalation), and Bahya Kumbhaka (outer retention). regulates the mind. HYP II.2: "Yavaddharanam ayati yavat pranasya gacchati, tavad eva mano yati yavat pranasya tisthati" – meaning the mind moves with the breath, and when the breath is steady, the mind becomes steady(3). Patanjali's Yoga Sutras (II.50) goes further to describe Pranayama as "Bahya-abhyantara-stambha-vrttir desa-kala-sankhyabhih….", emphasising the importance of ratio, time, and the subtle aspects for the mind's calm state(4). " The Bhagavad Gita (6.11-12) states: "Sucau dese pratisthapya sthiram asanam atmanah, natyucchritam nati-nicam cailajina-kusottaram," which emphasises the importance of a steady seat and breath regulation for concentration and emotional balance(10).

MODERN ADAPTATION: BOX BREATHING:

The yogic practice of Sama Vritti, in which there is an equal ratio of Puraka (inhalation), Antara Kumbhaka (inner retention), Rechaka (exhalation), and Bahya Kumbhaka (outer retention), is directly correlated with box breathing. The four-part structure of box breathing is in line with the Hatha Yoga Pradipika (II.50-51), in which equilibrium of prana is said to stabilise the mind, as it is adapted into a contemporary form. Box breathing is a simple, universal breathing practice that can be done by anyone, without needing any equipment or specific training. Scientific studies have proven its effects on our autonomic nervous systems, HRV, vagal tone, and emotional well-being (1,6,11). So, box breathing is a fine example of how ancient yogic wisdom is being adapted into a contemporary form.

PSYCHOPHYSIOLOGICAL MECHANISM:(12–18)

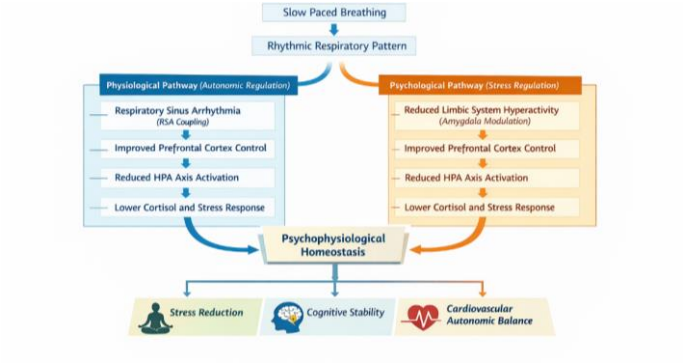

Fig-1: Psychophysiological Balance

OCCUPATIONAL APPLICATION OF SAMA VRITTI PRANAYAMA:

Sama Vritti Pranayama is an example of the wide range of applications. For education, particularly in medical science, it has been shown to reduce stress and improve sleep, resulting in improved academic performance(12,19). For patients with chronic pain, box breathing has been shown to reduce sympathetic nervous system activity, reducing pain and improving recovery(7). For sportsmen, it improves cardiovascular stability, concentration, and mental toughness(20), while in corporate environments, it is used as an effective cost-saving solution to reduce stress and improve concentration(21). Studies have also shown its application in anxiety reduction and emotional control during acute stress (22). In high-stakes professions, box breathing has been used by the U.S. Navy SEALs to help them stay relaxed, focused, and make rational decisions during high-pressure situations(12). Trials conducted recently have shown improved HRV and stress regulation in real-world scenarios. Sama Vritti Pranayama, therefore, proves its applicability in various settings, thus serving as a bridge between traditional yogic science and modern science.

CONCLUSION:

This paper was undertaken to bridge the classical yogic wisdom with modern scientific validation for the practice of Sama Vritti Pranayama and its adaptation to box breathing. While classical texts like the Hatha Yoga Pradipika and Yoga Sutras highlight the importance of equal breathing for mental stability, modern scientific validation highlights the benefits for stress management, autonomic balance, and emotional regulation. This review aims to highlight the practice's utility in various fields like education, healthcare, corporate, sports, and military. However, there are some limitations. The majority are pilot studies with small and specific populations. Neurophysiological validation is absent since HRV and vagal tone are indirect measures. EEG and fMRI are underutilised modalities. Sustainability is also not well understood since short-term interventions are more commonly used. Comparative studies with other pranayamas, such as Anulom Vilom and Bhramari, and mindfulness are required to determine relative efficacy.

REFERENCES:

1.Iyengar BKS. Light on Pranayama: Prāṇāyāma Dīpikā. HarperCollins; 1993. 296 p.

2.Pal GK, Velkumary S, Madanmohan null. Effect of short-term practice of breathing exercises on autonomic functions in normal human volunteers. Indian J Med Res. 2004 Aug;120(2):115–21. PubMed PMID: 15347862.

3. Pancham Singh. Hatha Yoga Pradipika - Sanskrit Text with English Translatlion and Notes [Internet]. [cited 2026 Mar 5]. 202 p. Available from: http://archive.org/details/HathaYogaPradipika-SanskritTextWithEnglishTranslatlionAndNotes

4. Patanjali Yogasutra | PDF | Yoga | Yoga Sutras Of Patanjali [Internet]. [cited 2026 Mar 6]. Available from: https://www.scribd.com/document/1007995078/Patanjali-Yogasutra

5. Brown RP, Gerbarg PL. Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: part I-neurophysiologic model. J Altern Complement Med. 2005 Feb;11(1):189–201. doi:10.1089/acm.2005.11.189 PubMed PMID: 15750381.

6. Breathing-Based Meditation Decreases Posttraumatic Stress Disorder Symptoms in U.S. Military Veterans: A Randomized Controlled Longitudinal Study - Seppälä - 2014 - Journal of Traumatic Stress - Wiley Online Library [Internet]. [cited 2026 Mar 7]. Available from: https://onlinelibrary.wiley.com/doi/10.1002/jts.21936

7. Busch V, Magerl W, Kern U, Haas J, Hajak G, Eichhammer P. The effect of deep and slow breathing on pain perception, autonomic activity, and mood processing--an experimental study. Pain Med. 2012 Feb;13(2):215–28. doi:10.1111/j.1526-4637.2011.01243.x PubMed PMID: 21939499.

8. Jerath R, Edry JW, Barnes VA, Jerath V. Physiology of long pranayamic breathing: neural respiratory elements may provide a mechanism that explains how slow deep breathing shifts the autonomic nervous system. Med Hypotheses. 2006;67(3):566–71. doi:10.1016/j.mehy.2006.02.042 PubMed PMID: 16624497.

9. Zaccaro A, Piarulli A, Laurino M, Garbella E, Menicucci D, Neri B, et al. How Breath-Control Can Change Your Life: A Systematic Review on Psycho-Physiological Correlates of Slow Breathing. Front Hum Neurosci. 2018 Sep 7;12:353. doi:10.3389/fnhum.2018.00353 PubMed PMID: 30245619; PubMed Central PMCID: PMC6137615.

10.VivekaVani. Bhagavad Gita: Chapter 6, Verse 11-12. VivekaVani [Internet]. 2021 May 3 [cited 2026 Mar 7]. Available from: https://vivekavani.com/b6v11/

11.Brown RP, Gerbarg PL. Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: part I-neurophysiologic model. J Altern Complement Med. 2005 Feb;11(1):189–201. doi:10.1089/acm.2005.11.189 PubMed PMID: 15750381.

12.A COMPARATIVE STUDY ON BOX BREATHING TECHNIQUE TO IMPROVE THE QUALITY OF SLEEP IN FIRST YEAR MEDICAL STUDENTS. [Internet]. [cited 2026 Mar 5]. Available from: https://www.researchgate.net/publication/377193804_A_COMPARATIVE_STUDY_ON_BOX_BREATHING_TECHNIQUE_TO_IMPROVE_THE_QUALITY_OF_SLEEP_IN_FIRST_YEAR_MEDICAL_STUDENTS

13.U.S. Navy SEAL Guide to the Elements of Survival. Skyhorse Publishing [Internet]. [cited 2026 Mar 5]. Available from: https://www.skyhorsepublishing.com/9781626368187/u-s-navy-seal-guide-to-the-elements-of-survival/

14.Giorgi F, Tedeschi R. Breathe better, live better: the science of slow breathing and heart rate variability. Acta Neurol Belg. 2025 Dec;125(6):1497–505. doi:10.1007/s13760-025-02789-w PubMed PMID: 40252198.

15.Box Breathing and Prolonged Exhalation and Normal Breathing in Stress and Cognitive Performance and Acute Stress Reaction - Clinical Trials Registry - ICH GCP [Internet]. [cited 2026 Mar 5]. Available from: https://ichgcp.net/clinical-trials-registry/NCT06986135

16.Russo MA, Santarelli DM, O'Rourke D. The physiological effects of slow breathing in the healthy human. Breathe. 2017 Dec;13(4):298–309. doi:10.1183/20734735.009817 PubMed PMID: 29209423; PubMed Central PMCID: PMC5709795.

17.Lehrer PM, Gevirtz R. Heart rate variability biofeedback: how and why does it work? Front Psychol. 2014 Jul 21;5:756. doi:10.3389/fpsyg.2014.00756 PubMed PMID: 25101026; PubMed Central PMCID: PMC4104929.

18.Laborde S, Mosley E, Thayer JF. Heart Rate Variability and Cardiac Vagal Tone in Psychophysiological Research - Recommendations for Experiment Planning, Data Analysis, and Data Reporting. Front Psychol. 2017;8:213. doi:10.3389/fpsyg.2017.00213 PubMed PMID: 28265249; PubMed Central PMCID: PMC5316555.

19.Lakshmanan DC. EFFECTS OF SAMA VRITTI PRANAYAMA ON STRESS MANAGEMENT AMONG POSTGRADUATE STUDENTS. Vol. 10. 10(1).

20.Post-Exercise Controlled Breathing Enhances Cardiovascular Recovery and Autonomic Balance: A Randomised Crossover Study | MDPI [Internet]. [cited 2026 Mar 7]. Available from: https://www.mdpi.com/1648-9144/62/2/318

21.Sharma M, Rush SE. Mindfulness-based stress reduction as a stress management intervention for healthy individuals: a systematic review. J Evid-Based Complement Altern Med. 2014 Oct;19(4):271–86. doi:10.1177/2156587214543143 PubMed PMID: 25053754.

22.The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress 0in Healthy Adults - PMC [Internet]. [cited 2026 Mar 7]. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC5455070/

23.Allen AP, Kennedy PJ, Dockray S, Cryan JF, Dinan TG, Clarke G. The Trier Social Stress Test: Principles and practice. Neurobiol Stress. 2017 Feb;6:113–26. doi:10.1016/j.ynstr.2016.11.001