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## Investigating the effects of yogic intervention on cardio-respiratory endurance, oxygen saturation levels, emotional intelligence, and psychological well-being: A review study

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### Abstract

Yoga, an ancient practice originating from India, has transcended its philosophical roots to become a widely recognized approach to holistic well-being. Beyond its traditional reputation for physical flexibility and strength, research increasingly reveals its multifaceted potential as an intervention for various modern health concerns. By analyzing the findings of previous studies, this review aims to provide a comprehensive understanding of the potential benefits of yoga for promoting physical and mental health. This article delves into the core components of yoga interventions, their applications, and the scientific evidence supporting their efficacy. It examines existing research on the impact of yoga on cardio-respiratory endurance, oxygen saturation levels (SpO<sub>2</sub>), emotional intelligence (EI), and psychological well-being. In the studies reviewed, yoga interventions appeared to be highly effective in improving cardio-respiratory endurance, SpO<sub>2</sub>, EI, and psychological well-being. Additional studies using methodological quality and adequate control interventions are highly encouraged on a larger scale to implement the yogic intervention as a beneficial supportive/adjunct treatment.

**Keywords:** Yogic intervention, physical flexibility, mental health, cardio-respiratory endurance, oxygen saturation levels (SpO<sub>2</sub>), emotional intelligence (EI), and psychological well-being

### Introduction

Yoga, an ancient practice originating in India, focuses on overall fitness through *pranayamas* (breath-control exercises), *asanas* (yoga postures), and *dhyana* (meditation). Like other forms of yoga, hatha yoga is purported to quiet the mind and focus the concentration; however, of all the yoga traditions, the importance of physical fitness is emphasized most in hatha yoga [1]. Regular practice of yoga promotes strength, endurance, and flexibility and facilitates characteristics of compassion, and greater self-control while cultivating a sense of calmness, and well-being. The practice of yoga can enhance health and overall fitness [2], regulate all body functions in a balanced manner, and help provide sustainable health [3, 4].

### Unveiling the Multifaceted Approach of Yoga

Yoga interventions are not a monolithic entity. They encompass a diverse range of practices, often incorporating elements from various yoga branches. However, some core components are frequently integrated: Asana, often referred to as poses, aims to improve flexibility, strength, and balance [5]. They also promote body awareness and proprioception, the ability to sense the body's position and movement in space. Pranayama plays a crucial role in yoga, focusing on controlled and mindful inhalation and exhalation. Pranayama is believed to influence the nervous system, promoting relaxation and stress management [6]. Meditation practices encourage focused attention and present-moment awareness. This can cultivate calmness, self-awareness, and emotional regulation [7].

Relaxation techniques: Yoga often incorporates relaxation techniques like deep breathing and visualization to induce a state of physical and mental ease [8]. These components are often

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interwoven, creating a synergistic effect that addresses physical and mental health concerns.

### Addressing Modern Concerns

The diverse nature of yoga interventions allows them to be adapted to address a wide range of health issues. Studies have shown that yoga interventions can effectively reduce stress hormones and anxiety symptoms, likely due to the combination of physical postures, breathing exercises, and meditation (Lemay, V. *et al*, 2019) <sup>[9, 10]</sup>. While further research is needed, growing evidence suggests that yoga can be an effective complementary therapy for depression, potentially improving mood and reducing depressive symptoms <sup>[11]</sup>. Yoga interventions incorporating gentle movement, breathing exercises, and relaxation techniques

have shown promise in managing chronic pain, potentially improving pain tolerance, and reducing reliance on medication <sup>[12]</sup>. Yoga practices promoting relaxation and stress reduction can improve sleep quality by reducing the time it takes to fall asleep and increasing sleep duration <sup>[13]</sup>.

### Cardio-Respiratory Endurance: The Engine of Physical Activity

Cardiorespiratory endurance, also known as aerobic fitness or aerobic capacity, is a fundamental aspect of physical health and well-being. Cardiorespiratory endurance serves as the engine of this process, ensuring the efficient delivery and utilization of oxygen, the fuel for cellular respiration. At the core of cardiorespiratory endurance lies the coordinated effort of three key systems <sup>[14]</sup> (Fig: 1):

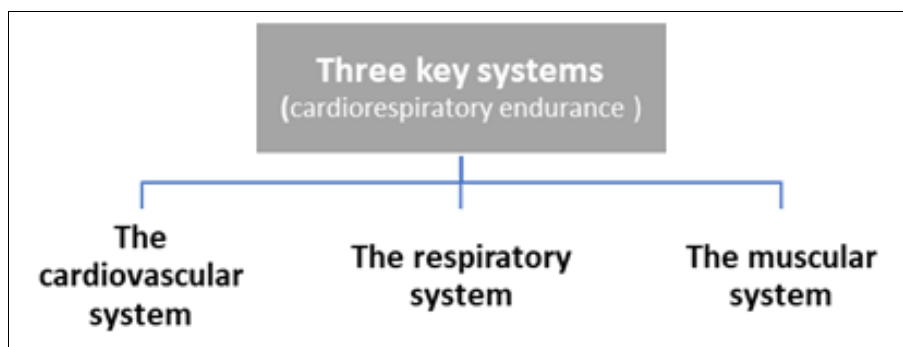


Fig 1: Three key systems

Several studies have reported improvements in cardiorespiratory endurance (measured by  $VO_2$  max) following yoga programs <sup>[15]</sup>. These improvements are likely due to the combination of physical postures, breathing exercises, and relaxation techniques, which enhance cardiovascular efficiency and increase lung capacity <sup>[16]</sup>.

### Measurement of Cardiorespiratory Endurance

The cardiorespiratory endurance tests most commonly associated with a positive change in a health marker are Maximal Oxygen Uptake ( $VO_2$  max measures the maximum rate at which requires laboratory testing using equipment like treadmills or cycle ergometers), Submaximal exercise tests (involve exercising at a predetermined intensity) often based on heart rate, and monitoring various physiological parameters to estimate  $VO_2$  max and Field tests (conducted with the treadmill and cycle ergometer) <sup>[17]</sup>.

### Oxygen Saturation Levels

Oxygen saturation ( $SpO_2$ ) is a critical physiological parameter reflecting the percentage of hemoglobin molecules in the blood bound to oxygen.  $SpO_2$  is a crucial indicator of oxygen delivery within the body. Understanding its significance, normal ranges (between 95% and 100%) <sup>[18]</sup>, and potential implications of deviations empower individuals to monitor their health and seek medical attention when necessary. Yoga, particularly pranayama, has been associated with increased blood oxygen saturation levels <sup>[19, 20]</sup>. This can be attributed to improved respiratory function and efficient oxygen utilization by the body <sup>[20]</sup>.

### Measurement Techniques

Pulse oximetry is the most common non-invasive method for measuring  $SaO_2$ . It utilizes a fingertip device that emits light

of specific wavelengths and measures the differential absorption by oxygenated and deoxygenated hemoglobin <sup>[21]</sup>. Arterial blood gas (ABG) analysis, a more invasive procedure, provides a more precise measurement of blood gases, including oxygen and carbon dioxide levels <sup>[22]</sup>.

### Implications of Abnormal $SaO_2$

- Hypoxemia (low  $SpO_2$ ):**  $SpO_2$  levels below 90% are considered hypoxemia and may indicate various underlying conditions, including, respiratory problems (Pneumonia, chronic obstructive pulmonary disease (COPD), and asthma), Cardiac issues (Congestive heart failure can impair blood circulation, hindering oxygen delivery to tissues) <sup>[23]</sup>.
- Hyperoxia (high  $SpO_2$ ):** While less common,  $SaO_2$  levels exceeding 100% (rarely encountered) are termed hyperoxia. This can occur due to supplemental oxygen therapy or certain medical conditions <sup>[24]</sup>.

### Emotional Intelligence

EI, a widely used conceptualization by Salovey and Mayer (1990) describes it as "the ability to monitor one's own and other people's emotions, to discriminate between different emotions and label them appropriately, and to use emotional information to guide thinking and behavior." Emotional intelligence is a multifaceted concept encompassing the ability to understand, manage, and utilize emotions effectively <sup>[25]</sup>. Studies suggest that yoga practice may positively impact emotional intelligence, encompassing self-awareness, self-regulation, social awareness, and relationship management <sup>[26]</sup>. Yoga techniques like mindfulness meditation are thought to enhance emotional regulation by promoting self-awareness and fostering healthy coping mechanisms <sup>[27]</sup>.

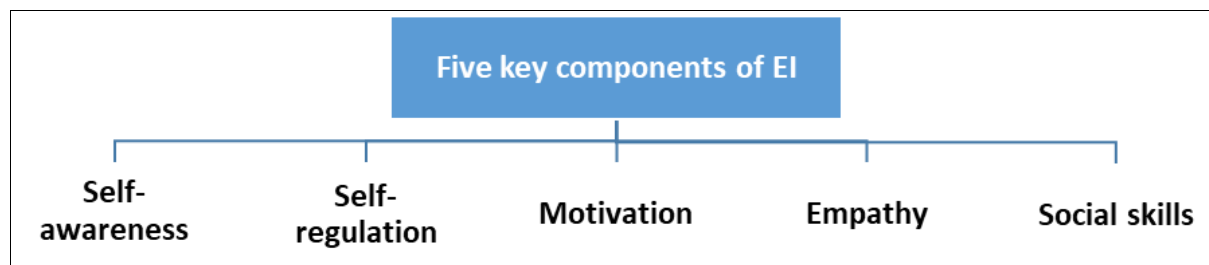


Fig 2: Goleman (1995) emphasizes five key components of EI [28]

### Measuring Emotional Intelligence (EI)

Assessing emotional intelligence is complicated due to the subjective nature of emotions. Methods for evaluating EI include self-report inventories, ability measures, and 360-degree feedback [29].

### Psychological Well-Being

Ryff and Keyes (1995) [30], PWB is "a multidimensional construct that refers to individuals' cognitive and emotional evaluations of their lives, including their sense of purpose, mastery, autonomy, personal growth, positive relationships

with others, and self-acceptance." This multidimensional perspective underscores the various psychological aspects that contribute to an individual's overall well-being. A growing body of research suggests that yoga interventions can improve various aspects of psychological well-being, including reducing anxiety and depression, promoting stress management, and enhancing subjective well-being [31, 32]. These benefits may be attributed to the multifaceted nature of yoga, which addresses both physical and mental aspects of well-being.

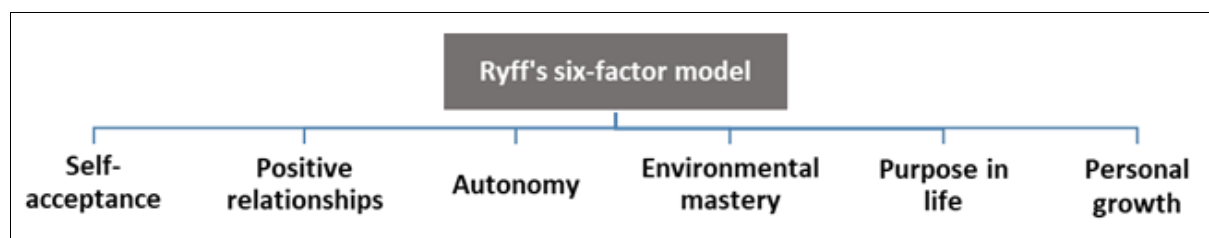


Fig 3: Building upon Ryff's six-factor model, this section explores the essential components of PWB [30]

### Method of Review

To identify Cardio-Respiratory Endurance, Oxygen Saturation Levels, Emotional Intelligence, and Psychological Well-Being opportunities offered by Yoga, first, review questions were specified in a clear, unambiguous, and structured manner. Then appropriate databases (i.e. Medline, PubMed, Google Scholar, ProQuest, JSTOR, Directory of Open Access Journals (DOAJ)). In a search for evidenced-based opportunities, we attended to all classified literature in part or full. It included peer-reviewed journal articles, books, and book chapters. To select only relevant articles and research papers, the title was carefully read at first and if it appeared that it was appropriate then it was saved at a particular destination in a folder. Then each article was read and interpreted properly and evidence-based opportunities were noted carefully.

### Discussion and Conclusion

#### Discussion

This review examined the existing literature on the impact of yogic intervention on various aspects of health and well-being, including cardiorespiratory endurance, oxygen saturation levels, emotional intelligence, and psychological well-being. While the studies included in this review presented promising findings, several points warrant further discussion:

#### Heterogeneity

The reviewed studies displayed significant heterogeneity in terms of yoga styles, intervention duration, participant demographics, and outcome measures. This makes it challenging to directly compare findings and draw definitive

conclusions about the overall effectiveness of yogic intervention.

#### Limited methodological rigor

Some studies lacked robust methodologies, including small sample sizes, short intervention periods, and potential for bias due to the absence of control groups. These limitations restrict the generalizability of findings and necessitate further research with stronger designs.

#### Underlying mechanisms

The studies primarily focused on the effects of yoga, with limited exploration of the mechanisms underlying these effects. Future research should investigate the physiological and psychological pathways through which yoga exerts its positive influence.

#### Conclusion

Yoga interventions offer a multifaceted approach to promoting well-being, addressing both physical and mental health concerns. Their adaptability and growing scientific backing make them a valuable tool in the healthcare landscape. While not a replacement for conventional treatments, yoga interventions can serve as a powerful complementary approach, empowering individuals to take an active role in managing their health and well-being.

This review highlights the potential of yoga to improve cardio-respiratory endurance, oxygen saturation levels, emotional intelligence, and psychological well-being. However, the existing research base is not yet conclusive, and further studies with robust methodologies are needed to solidify these findings. Future research should also explore

the specific yoga practices and components that contribute most significantly to these various benefits. It is important to note that most studies acknowledge the need for further research with larger sample sizes and stronger study designs. However, the current evidence base provides promising support for the potential of yoga interventions. Despite the limitations, this review highlights the potential of yogic intervention in improving various aspects of health and well-being. The findings suggest that yoga may be beneficial for enhancing cardiorespiratory endurance, oxygen saturation levels, emotional intelligence, and psychological well-being. However, further research with robust methodologies, standardized interventions, and exploration of underlying mechanisms is crucial to definitively establish the effectiveness of yoga and its potential applications in various health promotion and therapeutic contexts.

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