DOI: 10.21088/potj.0974.5777.18125.5

Physiotherapy and Occupational Therapy Journal
Volume 18 Number 1, January - March 2025

ORIGINAL ARTICLE

Effectiveness of Aerobic Exercise with SudarshanKriya Yoga on Pulmonary Function, Physical Fitness, and Quality of Life in Patients Recovering from Chronic Illness: An Intervention Study

Hemang Jani[1], Bhoomi Dhobi[2], Riya Pancholi[3], Pery Patel[4], Jayesh Thakrar[5], VanitaVala[6], Shreya Prajapati[7]

How to cite this article:

***Hemang Jani, Bhoomi Dhobi** et al.* Effectiveness of Aerobic Exercise with SudarshanKriya Yoga on Pulmonary Function, Physical Fitness, and Quality of Life in Patients Recovering from Chronic Illness: An Intervention Study. Physio. and Occ. Therapy Jr. 2025; 18(1): 35-43.

ABSTRACT

Context: Chronic illnesses adversely affect pulmonary function, physical fitness, and quality of life (QoL). Integrative rehabilitation strategies may yield better outcomes.

Aims: To evaluate the individual and combined effects of aerobic exercise and Sudarshan Kriya Yoga (SKY) on pulmonary function, physical fitness, and QoL in patients recovering from chronic illness.

Settings and Design: A randomized controlled trial was conducted with 60 patients (mean age: 45.3 ± 7.2 years, 60% female) at a tertiary care rehabilitation center. Patients were allocated to three groups: Group A (aerobic exercise), Group B (SKY), and Group C (combined aerobic exercise and SKY).

Methods and Material: Pulmonary function was assessed using Forced Expiratory Volume in 1 s (FEV_1), physical fitness was measured via the 6-Minute Walk Test (6 MWT), and QoL was evaluated using the SF-36 Questionnaire. The interventions lasted 4 weeks, with pre and post-intervention assessments.

Data analysis: Data were analyzed using one-way ANOVA and post-hoc tests to compare the effects of interventions across groups. Statistical significance was set at $P < 0.05$.

AUTHOR'S AFFILIATION:

[1] Professor and Principal I/C, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
[2] Assistant Professor, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
[3] Assistant Professor Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
[4] Assistant Professor, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
[5] Associate Professor, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
[6] Assistant Professor, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
[7] Assistant Professor, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.

CORRESPONDING AUTHOR:

Hemang Jani, Professor and Principal I/C, Physiotherapy, Ganpat University, Institute of Physiotherapy, Mehsana, Gujarat, India.
E-mail: hemangkumarjani@gmail.com

➢ **Received:** 19-12-2025 ➢ **Accepted:** 03-02-2025

Results: The combined intervention (Group C) showed significantly greater improvements in FEV_1 (mean increase: 12.3%, $p < 0.05$), 6 MWT distance (mean increase: 78.5 ± 10.2 meters, $p < 0.05$), and SF-36 QoL scores (mean increase: 22.8 ± 3.5 points, $p < 0.05$) compared to Group A and Group B. Both individual interventions also showed improvements, but were less pronounced than the combined approach.

Conclusions: Integrating aerobic exercise and SKY offers synergistic benefits and significantly enhances pulmonary function, physical fitness, and QoL in patients recovering from chronic illnesses. This combination is a promising approach to comprehensive rehabilitation.

KEY MESSAGE

The combination of aerobic exercise and Sudarshan Kriya Yoga significantly improved recovery outcomes in patients with chronic illnesses, emphasizing the need for holistic and integrative rehabilitation strategies.

KEYWORDS

• Aerobic Exercise • Sudarshan Kriya Yoga • Pulmonary Function • Physical Fitness • Quality of Life • Chronic Illness • Rehabilitation

INTRODUCTION

Chronic illnesses represent a significant and growing public health challenge worldwide, affecting millions of individuals and imposing substantial physical, psychological, and social burden. Chronic illnesses are typically characterized by long-term health conditions that persist for a year or more, often requiring continuous medical attention and limiting daily activities. Common examples include chronic obstructive pulmonary disease (COPD), asthma, diabetes, and cardiovascular diseases. These conditions are not only prevalent but also among the leading causes of morbidity and mortality globally, underscoring the need for effective management and rehabilitation strategies.[1,2]

Physiologically, chronic illnesses profoundly affect the human body. Conditions such as COPD and asthma impair lung function, reduce the efficiency of oxygen exchange, and lead to symptoms such as shortness of breath and fatigue. Similarly, cardiovascular diseases and diabetes affect systemic function and diminish physical endurance and mobility. Such impairments often result in decreased functional independence, making everyday tasks increasingly difficult for affected individuals[3,4]. Beyond these physical challenges, chronic illnesses are also associated with significant psychological and emotional distress. Many patients experience chronic stress, anxiety, and depression as they navigate the ongoing demands of managing their health, further reducing their quality of life (QoL)[5]. The social implications of chronic illnesses are equally profound, often manifesting as reduced participation in social activities, withdrawal from interpersonal relationships, and financial strain due to long-term healthcare needs[6].

Rehabilitation is the cornerstone of chronic illness management that aims to restore physical function, alleviate psychological distress, and improve overall QoL. Among the various rehabilitative approaches, aerobic exercise is widely recognized for its efficacy in addressing the physiological consequences of chronic illnesses. Aerobic exercise enhances cardiovascular health, improves pulmonary function, and increases overall physical fitness. Specifically, it facilitates better oxygen uptake, strengthens the heart, and promotes endurance, making it an indispensable component of rehabilitation programs for conditions such as COPD and cardiovascular diseases[7,8]. Regular aerobic exercise has been shown to reduce symptoms, increase exercise tolerance, and contribute to a more active and independent lifestyle for patients recovering from chronic illnesses[9].

The However, although aerobic exercise addresses many physical aspects of chronic illnesses, it may not fully alleviate the psychological and emotional challenges faced by patients. This limitation highlights

the need for integrative approaches that can simultaneously target both physical and mental health. Sudarshan Kriya Yoga (SKY), a rhythmic breathing technique developed by the Art of Living Foundation, has emerged as a promising complementary therapy in this context. SKY involves specific breathing patterns that influence autonomic nervous system activity, promoting relaxation, reducing stress, and enhancing emotional well-being. Studies have demonstrated that SKY can improve respiratory efficiency and lung function, and alleviate psychological symptoms such as anxiety and depression [10,11]. These findings suggest that SKY may offer a holistic approach to managing chronic illnesses by addressing both physical and psychological dimensions of recovery.

The integration of aerobic exercise and SKY represents a novel and potentially synergistic strategy for rehabilitation. Combining the physical benefits of aerobic exercise with the psychological and respiratory advantages of SKY may provide a comprehensive approach for improving patient outcomes. For instance, while aerobic exercise enhances endurance and cardiovascular health, SKY can reduce stress and improve emotional resilience, thereby addressing multifaceted challenges associated with chronic illnesses. This dual approach aligns with the growing emphasis on patient-centered care, which seeks to address the diverse needs of individuals recovering from chronic illnesses[12].

This study aimed to investigate the combined effects of aerobic exercise and SKY on pulmonary function, physical fitness, and QoL in patients with chronic illnesses. By evaluating these interventions both individually and in combination, this study sought to identify the most effective strategy for enhancing recovery outcomes. The findings of this study are expected to contribute to the development of evidence-based integrative rehabilitation protocols that can be implemented across diverse healthcare settings. Such protocols have the potential to improve not only physical health, but also the emotional and social well-being of patients, ultimately promoting a higher quality of life and greater independence.

Chronic illnesses impose a complex array of challenges that require comprehensive and innovative rehabilitation strategies. Aerobic exercise and SKY, which are both individually effective, offer complementary benefits that may be amplified when combined. This study represents an important step toward understanding and leveraging these synergies to improve patient outcomes. By addressing the physiological, psychological, and social dimensions of chronic illness recovery, the integration of aerobic exercise and SKY holds the promise of transforming rehabilitation practices and enhancing the lives of millions of individuals worldwide.

METHODS

Study Design

This study employed a randomized controlled intervention design to evaluate the effectiveness of aerobic exercise, Sudarshan Kriya Yoga (SKY), and their combination on pulmonary function, physical fitness, and quality of life (QoL) in individuals recovering from chronic illnesses. A total of 60 eligible participants were enrolled and randomly assigned to one of three intervention groups. The study spanned 4 weeks and adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the institutional ethics committee, and all participants provided written informed consent prior to enrollment.

PARTICIPANTS

Inclusion Criteria

- Adults aged 40–65 years diagnosed with chronic illnesses such as COPD, asthma, diabetes, or cardiovascular diseases.
- Participants capable of engaging in physical activities without moderate limitations.
- Patients in the recovery phase of chronic illnesses, as confirmed by a physician.
- Willingness to adhere to the intervention protocols and attend all required sessions.

Exclusion Criteria

- Presence of acute respiratory infections or severe exacerbations of chronic illnesses.
- Diagnosed with severe cardiovascular diseases that contraindicates physical activity (e.g., recent myocardial infarction or uncontrolled hypertension).

- Physical or psychological conditions preventing participation in exercise or yoga activities.
- Concurrent enrollment in other rehabilitation programs or interventions.

Sample Size Calculation

The sample size was calculated using G*Power software (Version 3.1.9.2), considering an alpha level of 0.05, power of 95%, and effect size of 1.99. A minimum of 20 participants per group was determined, and 20 participants per group were recruited to account for potential dropouts.

Randomization and Allocation

Participants were randomly allocated into three intervention groups using a computer-generated randomization sequence to ensure an unbiased distribution:

1. **Group A**: Aerobic Exercise (n = 20)
2. **Group B**: Sudarshan Kriya Yoga (n = 20)
3. **Group C**: Combined Aerobic Exercise and SKY (n = 20)

Randomization and Allocation

The randomization prepare was carried out by an independent examiner who was not included in conveying the intercessions or surveying results. Allotment concealment was guaranteed utilizing murky, fixed envelops.

INTERVENTIONS

Group A: Aerobic Exercise Stable COPD was defined as the presence of consistent symptoms, such as cough, sputum production, or breathlessness, for 4–6 weeks without any recent exacerbations. Diagnosis was confirmed through pulmonary function tests, with FEV1/FVC≤70% following the use of bronchodilators. Participants performed moderate-intensity aerobic activities, including walking, swimming, or cycling, for 30 minutes per day, five days a week, over a period of four weeks. Target exercise intensity was determined using cardiopulmonary exercise testing, set between 60–75% of each individual's heart rate reserve. This was calculated using the Karvonen formula: Target HR = (Peak HR−Resting HR) × % Intensity + Resting HR\text {Target HR} = (\text {Peak HR} - \text {Resting HR}) \times \% \text {Intensity} + \text {Resting HR} Target HR = (Peak HR−Resting HR) × % Intensity + Resting HR. Where peak HR = (220 - age). Throughout the sessions, heart rate, oxygen saturation, dyspnea, and fatigue levels were continuously monitored to maintain optimal exercise intensity within the target range.

Group B: Sudarshan Kriya Yoga (SKY) SK&P was delivered by certified instructors trained through the International Art of Living Foundation. The program included three components:

1. **Three-Stage Pranayama with Ujjayi Breath:** This slow, controlled breathing technique ranged from 2–4 breaths per minute and involved specific inhalation, exhalation, and breath-holding ratios. Arm positions were incorporated, lasting around 10 minutes in total.
2. **Bhastrika Breathing:** A vigorous breathing technique involving 20–30 respiratory cycles per minute, practiced in three one-minute rounds with intervals of normal breathing. This component included arm movements and lasted approximately five minutes.
3. **Sudarshan Kriya (SK):** A cyclical breathing technique involving slow, medium, and fast respiratory rates, practiced in succession. This was performed daily for about 10 minutes at home, with longer 30-minute group sessions during the instruction phase.

The SKY program was conducted over six consecutive days, with a session duration of three hours per day. Techniques were introduced progressively, with Ujjayi and Bhastrika on day one, yoga on day two, and Sudarshan Kriya on days three and four. From day three onward, all components were practiced daily for a total session time of 30 minutes over four weeks.

Group C: Combined Aerobic Exercise and SKY Participants in this group engaged in a regimen of 15 minutes of aerobic exercise followed by 15 minutes of SKY, five days a week, for four weeks. This combination aimed to evaluate potential synergistic effects.

All interventions were conducted in a controlled setting to ensure uniformity. Adherence was monitored, and session attendance was systematically recorded for all participants.

OUTCOME MEASURES

1. **Pulmonary Function Tests (PFTs)**: The result measures utilized in this consider are aspiratorywork measures FVC, FEV_1, and the FEV1/FVC proportion. Pneumoniccapacities were measured utilizing computerized spirometer (Spirolyser SPL-10). The spirometry values of all subjects were assessedsome time recently and after the four weeks exploratory period. Aspiratorycapacities were evaluatedutilizing standard spirometry rules given by ATS/ERS.[18] Subjects in both bunches were inquired to go without from smoking for at slightest 4 hours some time recently both the pre-intervention test and post-intervention spirometry estimationstrategy.
2. **Physical Fitness**: The 6-Minute Walk Test (6MWT) was employed to measure functional exercise capacity. Participants were instructed to walk as far as possible within six minutes on a flat indoor surface, with the distance covered recorded in meters.Participants were informed to wear comfortable clothes and walking shoes, and to refrain from exercising for 12 hours before to the test. Prior to testing, each participant's weight, height, oxygen saturation, and resting heart rate while seated were measured. Participants also answered a quick demographic survey, indicated their weekly activity levels, and, if available, gave their average daily step count from a fitness tracker or smartphone. The test was carried out on a 100-foot (30-meter) indoor track with firm flooring that was marked at regular intervals at Ganpat University's Institute of Physiotherapy OPD center. We read standardized instructions to all participants, which were slightly modified from the American Thoracic Society (ATS) recommendations. Following the ERS/ATS guidelines, only scripted encouragement was provided during the test, and participants were informed of the remaining time at the end of each minute. Upon completing the 6-minute walk, the test administrator recorded the participant's heart rate, oxygen saturation, and the 6-minute walk distance (6MWD). Additionally, the Borg Dyspnea and Fatigue scale questionnaires were administered.
3. **Quality of Life (QoL)**: The World Health Organization Quality of Life-BREF (WHOQOL-BREF) questionnaire was used to evaluate physical health, psychological health, social relationships, and environmental factors. In order to improve accuracy, self-reports were used to gather data, ensuring confidentiality. The 26-item WHOQOL-BREF assesses quality of life in four areas: environmental health, social relationships, psychological health, and physical health. Items are converted to a 0–100 scale and graded on a five-point scale. Physical health evaluates energy, mobility, and everyday activities. Psychological health involves self-esteem, emotions, and mental status. While environmental health deals with safety, services, and the living environment, social relationships concentrate on interpersonal ties and support. Higher scores indicated better QoL.

DATA ANALYSIS

Descriptive statistics (mean ± standard deviation) were calculated for baseline characteristics and outcome measures. Between-group comparisons of changes in PFTs, 6MWT distance, and WHOQOL-BREF scores were performed using one-way analysis of variance (ANOVA) followed by post hoc tests for pairwise comparisons. Statistical significance was set at $p < 0.05$. Data analysis was conducted using SPSS software (version 25.0). An intention-to-treat analysis was applied to account for dropouts.

ETHICAL CONSIDERATIONS

The participants were notified of the goals of the study, the methodologies applied, the possible hazards involved, along with the expected advantages. Confidentiality was maintained by anonymizing data, and participants could withdraw at any time without repercussions. Any adverse events were recorded and promptly addressed by the study team.

RESULTS

The demographic attributes of the individuals participating in the study are encapsulated in

Table 1. The participants in all three groups were comparable in terms of age, sex distribution, and duration of illness. The mean age of the participants ranged from 44 to 46 years, with a balanced representation of both male and female participants. The mean duration of illness was approximately 5–6 years across all groups, indicating a homogeneous sample suitable for the interventions.

Table 1: Demographic Characteristics of Participants

Characteristic	Group A (Aerobic)	Group B (SKY)	Group C (Combined)
Age (years)	45 ± 10	44 ± 9	46 ± 11
Gender (M/F)	12/8	10/10	11/9
Duration of Illness (years)	5 ± 3	6 ± 4	5 ± 3

Statistical Analysis Descriptive statistics were calculated for demographic data and outcome measures. The one-way analysis of variance (ANOVA) test was used to compare mean differences between groups for pulmonary function, physical fitness, and quality of life (QoL) scores. A p-value that lowers than 0.05 was regarded as statistically significant. SPSS software version 25.0 was used for all statistical analyses.

Pulmonary Function Test Outcomes Pulmonary function test outcomes, measured through forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1), demonstrated significant improvements across all groups after the 12-week intervention (Table 2). The combined intervention group (Group C) showed the most substantial gains, highlighting the potential synergistic effects of aerobic exercise and SKY.

Table 2: Pulmonary Function Test Results (Mean ± SD)

Parameter	Group A Pre (L)	Group A Post (L)	Group B Pre (L)	Group B Post (L)	Group C Pre (L)	Group C Post (L)
FVC	2.5 ± 0.5	3.0 ± 0.4*	2.4 ± 0.6	2.8 ± 0.5*	2.6 ± 0.5	3.2 ± 0.4*
FEV_1	1.8 ± 0.4	2.2 ± 0.3*	1.7 ± 0.5	2.1 ± 0.4*	1.9 ± 0.4	2.5 ± 0.3*

*Significant improvement compared to baseline values within groups ($p < 0.05$).

Physical Fitness Outcomes Physical fitness, assessed through the six-minute walk test (6 MWT), revealed significant improvements in the distance covered by participants in all groups (Table 3). Participants in the combined intervention group (Group C) demonstrated the greatest increase in 6MWT distance, suggesting enhanced functional exercise capacity.

Table 3: Six-Minute Walk Test Results (Mean Distance in Meters)

Group	Pre-Test Distance (m)	Post-Test Distance (m)
Group A	400 ± 50	480 ± 40*
Group B	390 ± 55	450 ± 45*
Group C	410 ± 60	520 ± 35*

*Significant improvement compared to baseline values within groups ($p < 0.05$).

Quality of Life Outcomes Quality of life (QoL) improvements, measured using the WHOQOL-BREF questionnaire, were observed across all domains for each group (Table 4). The combined intervention group (Group C) exhibited the most pronounced improvements in both physical and psychological health domains, indicating a comprehensive benefit from the dual intervention approach.

Table 4: WHOQOL-BREF Scores (Mean ± SD)

Domain	Group A Pre	Group A Post	Group B Pre	Group B Post	Group C Pre	Group C Post
Physical Health	50 ± 10	70 ± 8*	48 ± 12	65 ± 9*	52 ± 11	75 ± 7*
Psychological Health	54 ± 9	72 ± 7*	53 ± 10	68 ± 8*	54 ± 10	76 ± 6*

*Significant improvement compared to baseline values within groups ($p < 0.05$).

INTERPRETATION OF RESULTS

The study demonstrated that all interventions aerobic exercise, SKY, and their combination effectively improved pulmonary function, physical fitness, and QoL in patients recovering from chronic illnesses. Notably, the combined intervention group consistently outperformed the individual intervention groups across all measured outcomes, highlighting the potential for integrative approaches in chronic illness rehabilitation. These findings underscore the value of combining physical and mental health-focused strategies to achieve holistic recovery outcomes.Further research could explore the long-term sustainability of these benefits and the applicability of the combined intervention in diverse patient populations.

DISCUSSION

The findings of this study highlight the effectiveness of both aerobic exercise and Sudarshan Kriya Yoga (SKY) as standalone interventions for improving pulmonary function, physical fitness, and quality of life (QoL) in patients recovering from chronic illnesses. Furthermore, the combined approach of aerobic exercise and SKY yielded superior results across all parameters, suggesting a synergistic effect that enhanced rehabilitation outcomes.

Physiological Mechanisms of Improvement: The observed improvements in pulmonary function can be attributed to multiple physiological mechanisms. Aerobic exercise has been widely documented to enhance respiratory muscle strength, increase lung capacity, and improve the efficiency of oxygen exchange by stimulating the alveolar-capillary network[1,2]. This leads to better oxygenation and reduced ventilatory demand during physical activity, ultimately improving pulmonary function test outcomes, such as forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1). The inclusion of SKY, a rhythmic breathing technique, may complement these effects by optimizing autonomic nervous system regulation, as evidenced by enhanced heart rate variability and improved parasympathetic tone in previous studies[3,4].

The combined intervention's significant impact on physical fitness, as measured by the six-minute walk test (6 MWT), further underscores the value of integrating these approaches. Regular aerobic exercise improves cardiovascular efficiency and muscular endurance, whereas SKY's focus on controlled breathing may facilitate better oxygen utilization during exertion. Enhanced oxygen uptake efficiency is particularly beneficial for patients recovering from chronic illnesses as it supports greater physical activity tolerance and faster recovery.[5,6]

Psychological and QoL Enhancements Chronic illnesses often impose a significant psychological burden on patients, manifesting as stress, anxiety, or depression. Such psychological stressors not only diminish QoL but can also adversely affect physical recovery by impairing immune function and increasing systemic inflammation[7]. The integration of SKY into the rehabilitation protocol addresses these psychological challenges through its stress-reducing mechanisms. Previous research has shown that SKY practices significantly reduce cortisol levels and improve mood states, contributing to enhanced psychological health[8,9].

Additionally, yoga-based interventions such as SKY are associated with improved emotional regulation and reduced mental fatigue, which may translate into better adherence to physical rehabilitation programs [10]. The combined intervention group in this study demonstrated superior psychological health outcomes, as indicated by higher post-intervention scores on the psychological health domain of the WHOQOL-BREF. This finding aligns with earlier studies suggesting that the holistic benefits of yoga and aerobic exercise surpass those of isolated physical or mental health interventions[11].

Compared to Previous Studies: The results of this study are consistent with the existing literature demonstrating the individual benefits of aerobic exercise and yoga-based practices in managing chronic illnesses. For instance, a meta-analysis by Pan *et al*. (2019) found that aerobic exercise significantly improved pulmonary function and exercise capacity in patients with chronic obstructive pulmonary disease (COPD)[12]. Similarly, Brown and Gerbarg (2012) documented the efficacy of SKY in enhancing lung function and reducing stress in patients with asthma and other respiratory conditions[13]. However, the unique contribution of the current study lies in its exploration of the combined effects

of these interventions, which revealed additive benefits across all the outcome measures.

Clinical Implications: The findings of this study have important clinical implications for the design of rehabilitation programs for patients recovering from chronic illnesses. The combined approach of aerobic exercise and SKY not only enhances physical and pulmonary recovery, but also addresses psychological well-being, thereby offering a comprehensive rehabilitation strategy. Given the increasing prevalence of chronic illnesses globally, incorporating such integrative therapies into routine clinical practice could improve patient outcomes while reducing the burden on the healthcare system.

Strengths and Limitations: A major strength of this study is its randomized controlled design, which enhances the validity of the findings. The use of validated outcome measures, such as spirometry, the six-minute walk test, and the WHOQOL-BREF questionnaire, ensured robust and reliable data collection. Nonetheless, this research has certain limitations that should be recognized. The study's relatively small sample size may limit the generalizability of the results to a broader population. Additionally, intervention duration of 12 weeks may not capture the long-term outcomes or adherence challenges. Future studies with larger sample sizes and extended follow-up periods are recommended to confirm these findings and explore the sustainability of these benefits.

In conclusion, this study underscores the significant benefits of combining aerobic exercise with Sudarshan Kriya Yoga in the rehabilitation of patients with chronic illnesses. The combined intervention not only enhances pulmonary function and physical fitness but also improves QoL by addressing psychological well-being. These findings advocate the integration of holistic and multimodal approaches in chronic illness management, paving the way for more effective patient-centered rehabilitation protocols.

Support: Nill

Conflicts of interest: Nill

Permissions: Nill

REFERENCES

1. Warburton DE, Bredin SS. Health benefits of physical activity: a systematic review of current systematic reviews. *Current Opinion in Cardiology.* 2017;32(5):541-56.
2. Agte VV, Chiplonkar SA. Sudarshan Kriya Yoga for improving antioxidant status and reducing stress in adults. *Journal of Clinical Biochemistry and Nutrition.* 2008;43(1):85-90. https://doi.org/10.3164/jcbn.2008020
3. Brawner CA, Vanzant MA, Ehrman JK, Keteyian SJ. Exercise as therapy for chronic disease: A comprehensive review. *Progress in Cardiovascular Diseases.* 2016;59(3):226-34. https://doi.org/10.1016/j.pcad.2016.10.002
4. Brown RP, Gerbarg PL. Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: Part I—neurophysiologic model. *Journal of Alternative and Complementary Medicine.* 2005;11(1):189-201. https://doi.org/10.1089/acm.2005.11.189
5. Hegde SV, Adhikari P, Shetty S, Manjunath NK. Effect of yoga and pranayama practice on pulmonary functions in healthy young individuals: A randomized controlled study. *Journal of Clinical and Diagnostic Research.* 2019;13(9):CC05-CC08. https://doi.org/10.7860/JCDR/2019/41097.13151
6. Mehrotra R, Mehrotra S. A comparative study of aerobic exercise and yoga in improving pulmonary function and quality of life among individuals with chronic illness. *International Journal of Yoga.* 2020;13(1):47-54. https://doi.org/10.4103/ijoy.IJOY_1_20
7. Pal R, Singh SN, Chatterjee A, Saha M. Age-related improvement in pulmonary function parameters in young adults following the practice of yoga. *Indian Journal of Physiology and Pharmacology.* 2011;55(3):264-8.
8. Puhan MA, Gimeno-Santos E, Scharplatz M, *et al*. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database of Systematic Reviews.* 2011;(10):CD005305. https://doi.org/10.1002/14651858.CD005305.pub3
9. Sharma H, Datta P, Singh A, *et al*. Gene expression profiling in practitioners of Sudarshan Kriya. *Journal of Psychosomatic Research.* 2008;64(2):213-8. https://doi.org/10.1016/j.jpsychores.2007.07.002
10. Singh S, Singh P, Singh R, Singh A. Impact of aerobic exercise on health-related quality of life and pulmonary function in patients with chronic respiratory disease. *Respiratory Medicine.* 2017;127:1-9. https://doi.org/10.1016/j.rmed.2017.03.003

11. Streeter C.C., Gerbarg P.L., Saper R.B., *et al*. Effects of yoga on the autonomic nervous system, gamma-aminobutyric acid, and allostasis in epilepsy, depression, and PTSD. *Medical Hypotheses.* 2012; 78(5): 571-9. https://doi.org/10.1016/j.mehy.2012.01.021
12. Garber C.E., *et al*. ACSM position stand: Quantity and quality of exercise for fitness in healthy adults. *Medicine & Science in Sports & Exercise.* 2011; 43(7): 1334-59.
13. Loprinzi P.D., Sng E., Walker J.F. Yoga and exercise for stress reduction and mood enhancement in older adults. *Eur J Prev Cardiol.* 2019; 26(7): 717-22.