



Review Article

## Practicing Surya Namaskar: A Sequence of Yogic Postures for Overall Health and Wellness among Healthy Adults

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### Abstract

**Background.** Yoga, an ancient practice rooted in Indian culture, has gained global recognition for its physical and mental health benefits. Among its practices, Surya Namaskar (SN) stands out as a holistic yogic Sun Salutation exercise combining postures, breathing, and mindfulness, offering physical vitality, mental calmness, and a practical solution to the challenges posed by modern sedentary lifestyles.

**Objectives.** The objective of the present systematic review was to analyze the effect of SN on overall health and wellness of healthy adults.

**Materials and methods.** A comprehensive search was conducted in five major databases, namely Scopus, PubMed, PubMed Central, Web of Science, and ScienceDirect, using the terms such as “Surya Namaskar”, “Sun Salutation”, “Surya Namaskar and physical fitness”, “Surya Namaskar for adults”, “Sun Salutation for overall health and wellness”, and “Surya Namaskar and sedentary lifestyle”. The articles published in English between 2011 and 2024 were considered in the current review. The systematic search and reporting adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The Quality Assessment Tool for Quantitative Studies was used to analyze the methodological quality of the included articles.

**Results.** Based on the inclusion and exclusion criteria, 117 articles were initially retrieved, out of which 11 were finally included, encompassing data from 445 healthy adults from three countries, aged between 18 and 65 years. The duration of the SN intervention varied from four to 24 weeks, with session frequency ranging from three days per week to daily, and a diverse number of cycles. The methodological quality analysis revealed that two articles were of strong, six of moderate, and the remaining three of weak quality.

**Conclusions.** This systematic review concludes that the practice of the yogic Sun Salutation exercise (SN) is beneficial for improving and maintaining physical fitness, physiological health, and psychological well-being, which determine the overall health and wellness of healthy adults.

**Keywords:** Sun Salutation, public health, general well-being, yoga, adults.

### Introduction

In ancient times, yoga the Indian rooted spiritual culture was refined and developed by Rishis (sages), but now it is spread all over the world in a variety of ways. Over the past few decades, yoga has gained significant popularity across the world due to its potential benefits for physical and mental health. Modern yoga integrates various practices—such as postures (asanas), breath control (pranayama), and meditation—that aim at promoting inner peace, physical vitality, and overall well-being (Bussing et al., 2012; Sengupta,

2012). This holistic approach, accessibility, the ability to be practised in groups or individually, and its ability to fit into even the busiest of schedules have made yoga increasingly popular for people of all ages and offer a simple yet effective means for maintaining overall health (Johnston, 2023; Paramashiva et al., 2024; Telles et al., 2021). Moreover, it is now seen as an alternative medicine in various fields of medical science. Most of the current research has shown that yoga is used as a therapy for various physical ailments before progressing to clinical conditions (Devi et al., 2024; Mondal et al., 2018). In today's fast-paced world, people's lives, work, and moves are changing dramatically over time (Parajuli et al., 2023). Due to huge advancements in technology, the conveniences provided by modern gadgets,

assistive devices, and vehicles, such as ride-hailing services like Ola and Uber, as well as innovations like escalators and lifts, have redefined how individuals approach daily tasks. Similarly, the rise of on-demand services, such as food delivery, has further contributed to the shift towards a more sedentary lifestyle. While these advancements have undoubtedly increased comfort and efficiency, they have also led to decreased physical activity among individuals, especially those in office-based or corporate settings, where long periods of sitting have become the schedule. In response, people are seeking natural ways to maintain their health and wellness (Kumar Singhal, 2023). Physical activity is an essential component of a balanced lifestyle, and while some particular professions—such as factory workers—engage in vigorous physical work, homemakers are involved in different household chores, but a significant portion of the population, particularly those in desk-bound professions, find it challenging to incorporate exercise into their daily routines. Yoga, with its minimal space requirements, flexibility in practice, and focus on both physical and mental well-being, has emerged as a practical solution. In yoga, Surya Namaskar (SN), also known as the sun salutation, is a traditional way to express gratitude to the sun in the morning while executing a sequence of physical postures and controlled breathing techniques that are intended to provide a variety of psychological, spiritual, and bodily advantages (Hipparagi & Gangadhar, 2019; Sinha & Sinha, 2014). SN is relatively new to the Western world but common to East Asian populations who perform it as an alternative to traditional methods of aerobic exercise (Mody, 2011). Facing east, When SN is practiced in the early morning, it helps to release stiffness, refresh the body, revive the mind, and purify subtle energy channels. It is thought that the regular practice of SN enhances the sun-based plexus, which broadens one's creative and intuitive potential. An exact breathing pattern is followed during the SN series of asanas. It provides physical strength, flexibility, and mental well-being while revitalizing every single cell in the body (Bhandage et al., 2024). SN comprises a series of postures that allow the spinal column and the upper and lower limbs to flex and extend through their full range of motion. It requires extended stretches in various body areas and improves flexibility by causing muscle and connective tissue to extend through elastic elongation (Krishma, 2024; Suwannakul et al., 2024). SN combines 12 postures where 7 different asanas are performed in a sequential manner, such as Pranamasan (Prayer pose), Hasta Utthanasan (raised arms pose), Padahastasan (hand to foot pose), Ashwa Sanchalanasan (Equestrian pose), Parvatasana (Mountain pose), Ashtanga Namaskar (Salute with eight parts or points), and Bhujangasan (Cobra pose), and five asanas Parvatasana (Mountain pose), Ashwa Sanchalanasan (Equestrian pose), Padahastasan (hand to foot pose), Hasta Utthanasan (raised arms pose), and Pranamasan (Prayer pose)—are repeated twice (Kumari et al., 2022; Pal et al., 2024; Venkatesh & Vandhana, 2022). SN is a body-mind technique that helps to reduce tension and anxiety while increasing mental calmness (Stec et al., 2023). Slow breathing exercises may reduce the sympathetic nervous system, heart rate, blood pressure (both systolic and diastolic), cortisol, or stress hormone, and the perception of stress (Bandyopadhyay et al., 2023; Pal et al., 2024). Previous research reported

their findings that SN enhances physical relaxation, mental calmness, and stress dispositions such as somatic stress concern and negative emotions in students (Stec et al., 2023). Increased evidence suggests that SN practices may impact different physical and physiological pathways, such as the cardiorespiratory system and musculoskeletal system, which are affected by sedentary lifestyles and are relevant to disease development and progression (Suri et al., 2025; Wirawan, 2018). The current review was done to gather and summarize the updated empirical evidence based on SN's impact on the overall health and wellness of healthy adults.

## Materials and Methods

### Search Strategy

For the current review, the literature search was initiated in July 2024 and continued through September 2024. Scopus, PubMed, PubMed Central, Web of Science, and ScienceDirect were thoroughly searched electronically to review the related literature. Reference lists from original and review articles were also considered to find out more studies. The search terms were “Surya Namaskar,” “Sun salutation,” “Surya Namaskar and physical fitness,” “Surya Namaskar for adults,” “Sun salutation for overall health and wellness,” and “Surya Namaskar and sedentary lifestyle.” All identified studies were included in Zotero software. At first, the duplicate articles were removed, and then the remaining articles were screened on title, abstract, and full text for eligibility. The systematic search of the present study was conducted according to Preferred Reporting Systematic Reviews (PRISMA) (Page et al., 2021) without meta-analysis and depicted in the PRISMA flow chart (Fig. 1). Also, specific study characteristics and report characteristics of the present study were conducted according to the Preferred Reporting Systematic Reviews (PRISMA2020).

### Inclusion Criteria

The relevant studies investigated the effect of Surya Namaskar (SN) on the health and wellness of healthy adults meeting the following criteria were considered for review:

- **Articles:** All the articles have been published in English since 2011 through databases like Scopus, PubMed, PubMed Central, Web of Science, and ScienceDirect, as well as the relevant studies found in the references list.
- **Participants:** The healthy adults of the mean age of 18 years and above.
- **Intervention:** Only SN practice with any frequency and duration was included in the present review.
- **Outcomes:** The investigations that measured any of the physical fitness components such as strength, speed, flexibility, and coordination, any of the physiological variables such as heart rate, blood pressure, body mass index, body fat percentage, waist-hip ratio, sleep quality, cardiorespiratory fitness such as  $VO_2$ max, oxygen consumption, vital capacity, inspiratory capacity, tidal volume, maximum ventilatory volume, peak expiratory flow rate, forced expiratory volume in one second, respiratory exchange ratio and any of the psychological variables such as depression, anxiety, stress, general well-being and cognitive functions like attention and

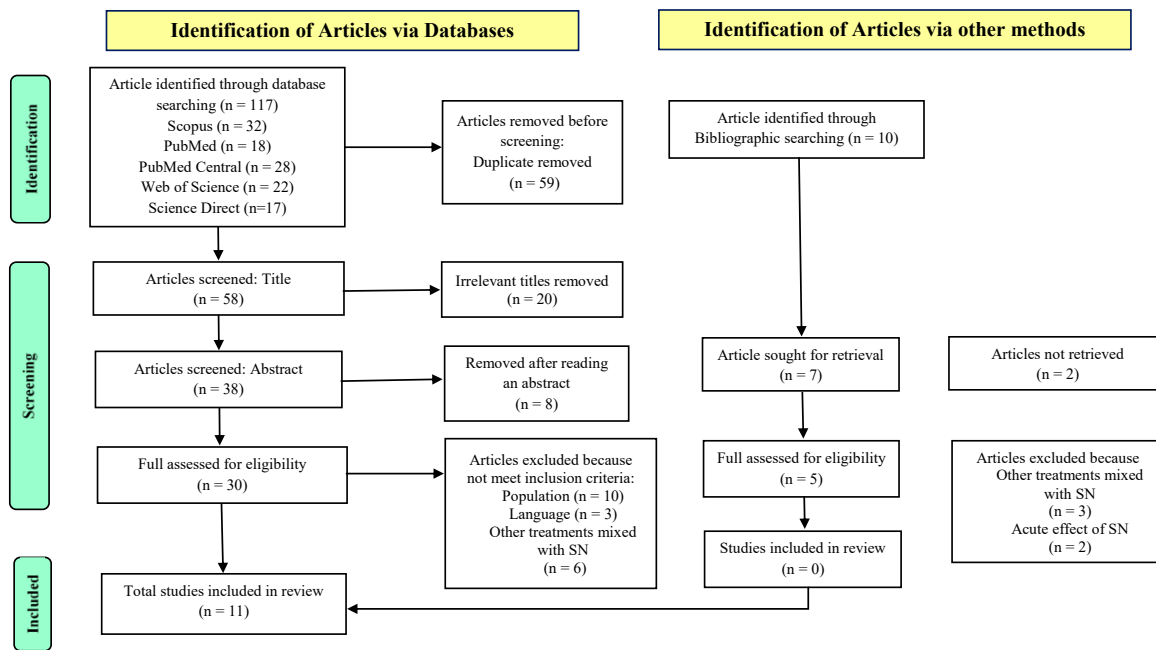


Fig 1. Search process and selection of the study (PRISMA 2020 flow diagram)

orientation, memory, fluency, visuospatial etc. were included.

- Study design: Random controlled trial (RCT), pre-post, repeated measure design, and pilot studies were considered.

#### Exclusion criteria

Studies were excluded for the following reasons:

- Studies conducted on participants who were suffering from chronic physical illnesses.
- Other yoga interventions like asanas, meditation, etc., combined with SN as a protocol, were excluded from the present review.

#### Quality assessment and risk of bias

The methodological quality and risk of bias of the included studies were assessed using the Quality Assessment Tool for Quantitative Studies (Thomas et al., 2004) by two researchers (TD and SM) individually. The tool has seven domains: selection bias, study design, confounders, blinding, data collection methods, withdrawals, and dropouts. Each domain was rated as strong, moderate, or weak, which indicates low, moderate, or high risk of bias in the included studies. Discrepancies were resolved through discussion with the remaining researcher (NB).

## Results

#### Study Details

A total number of 117 studies were initially searched through five databases and reference lists: Scopus (32), PubMed (18), PubMed Central (28), Web of Science (22), and Science Direct (17). After the title, abstract, and full

article screening, 30 studies were included for further analysis and assessment for eligibility. Based on inclusion and exclusion criteria, finally, 11 studies were included in the present systematic review. The entire study selection process is presented in Fig 1. All included studies were current and published between July 2011 and July 2024 and were RCT, pre-post, repeated measure designs, and pilot studies.

#### Participants

A total of 445 healthy adults aged between 18 and 65 years participated from three countries, viz., India, Indonesia, and Thailand. Out of 433 participants, 316 healthy participants underwent SN training, and the remaining 105 participants were part of control groups and other exercise groups. In the present systematic review, out of 11 included studies, only five (Balaji et al., 2024; Chawla et al., 2022; Dubey & Choudhary, 2024; Raja, 2023; Suwannakul et al., 2024) had a control group, while two (Mangaonkar & Puntambekar, 2018; Singh et al., 2017) had another exercise group, and the remaining four (Bhutkar et al., 2011; Karasugi et al., 2023; Kaur, 2021; Kodidala et al., 2021) had no control or other exercise group (Table 1).

#### Intervention Details

The present systematic review exclusively included experimental studies to observe only the effect of Surya Namaskar (SN) training on the overall health and wellness of healthy adults. SN, the yogic sun salutation exercise consists of 12 postures that are performed in a definite sequence depicted in Fig. 2. The minimum intervention span of SN in the included studies was four weeks, and the maximum duration was 24 weeks. The duration of the SN intervention varied greatly among the studies, ranging from daily intervention over six weeks to six days of intervention

**Table 1.** Details of study characteristics

Authors, Year, Country	Study details	Intervention details		Dependent variables	Outcomes
	Sample size Group Age range (R)/ mean age (M)	Intervention Span (IS), Session Frequency (SF), Session Duration (SD), No. of Cycles (C)	Study design		
Bhutkar et al., 2011 India	n = 79, EG= Male (49); Female (30), M = above 18 years	IS= 24 weeks, SF= 6 days/week, SD= NM, C= 24	Pre-post test (one group)	Muscle strength (upper and lower body), general body endurance, BMI, body fat (%), LBM	Improvement in muscle strength and general body endurance and LBM for male and female (p < 0.001), decreased body fat (%) for female (p < 0.001).
Singh et al., 2017 India	n= 40, EG1 (SN)= 20; EG2= 20, R= 18-30 years	IS= 6 weeks, SF= daily, SD= 5 minutes, C= NM	Pilot study	Respiratory parameters -TV, IC, VC, FEV1, MVV, PEFR	Improvement in TV, IC, VC, and MVV (p <0.001), PEER (p <0.01), FEV1(p <0.05).
Mangaonkar & Puntambekar, 2018 India	n=30, EG1 (SN)= 15; EG2= 15, R= 19-25 years	IS= 4 weeks, SF= NM, SD= 15 minutes, C= 8	Pre-post test (two group)	Hamstring flexibility	Improvement in flexibility (p=0.05)
Kaur, 2021 India	n= 15, EG= Male (15), R= 18-23 years	IS= 6 weeks, SF= 5 days/week, SD= 30-40 minutes, C= NM	Repeated measure (one group)	Strength, speed, endurance, flexibility and coordination	Improvement in all variables (0.05 level)
Kodidala et al., 2021 India	n= 85, EG= Male (50); Female (35), R= 18-25 years	IS= 12 weeks, SF= 6 days/week, SD= 60 minutes, C= NM	Pre-post test (one group)	Cardiovascular- respiratory parameters (VC, MVV, PEFR, VO2max) and cognitive functions (attention and orientation, memory, fluency, visuospatial)	Decreased pulse rate, BP (systolic and diastolic) (p<0.001), increased VC, MVV, PEFR, VO2max, and all cognitive parameters (p<0.001)
Chawla et al., 2022 India	n= 30, EG= 15; CG= 15, R= 18-40 years	IS= 8 weeks, SF= 3 days/week, SD= 40-45 minutes, C= 3+	Pre-post test (two group)	Sleep quality, GWB, HR, BP	Improvement in sleep quality, RHR and BP (p=0.01), and general well-being (p<0.05)
Karasugi et al., 2023 Indonesia	n= 20, EG= Male (11); Female (9), M= 59.25 ± 6.98 years	IS= 8 weeks, SF= 3 days/week, SD= 50 minutes, C= 3	Pre-post test (one group)	Flexibility of the upper and lower limbs twice	Improved upper and lower limb flexibility (p=0.001)
Raja, 2023 India	n= 30, EG= Male (15); CG= Male (15), R= 50-60 years	IS= 12 weeks, SF= 6 days/week, SD= 2 sessions/day, C= NM	Pre-post test (two group)	Depression and trunk flexibility	Decreased depression (p=0.05) and improved trunk flexibility (p=0.05).
Dubey & Choudhary, 2024 India	n=30, EG= Female (15); CG= Female (15), M= 20.80±0.52 years	IS= 6 weeks, SF= NM, SD= 22-35 minutes, C= 7+	Pre-post test (two group)	Back flexibility and lumbar flexion	Improvement in all selected variables (0.05 level).
Suwannakul et al., 2024 Thailand	n= 44, EG= Female (22); CG= Female (22), R= 19-22 years	IS= 8 weeks, SF= 3 sessions/ week, SD = 50 minutes, C= NM	RCT	Perceived stress, BMI, WHR, body fat percentage, Grip and leg strength, Forward trunk flexibility and VO2max	Decrease in Perceived Stress and BMI (p<0.05), improvement in forward back flexibility, strength (hand grip, leg) and VO <sub>2</sub> max (p<0.05).

**Table 1** (continued)

Balaji et al., 2024 India	n= 30, EG= Male (15), CG= Male (15), R= 18-20 years	IS= 6 weeks, SF= 5 days/week, SD= 45-60 minutes, C= NM	Pre-post test (two group)	Back flexibility and lumbar flexion	Improvement in both back flexibility and lumbar flexion (0.05 level).
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n - sample size; EG – experimental group; NM - not Mentioned; RCT – randomized controlled trial, BMI - body mass index; WHR - waist-hip ratio; TD - tidal volume; VC - vital capacity; IC - inspiratory capacity; MVV - maximum ventilatory volume; GWB - general wellbeing; PEER - peak expiratory flow rate; FEV1 - forced expiratory volume in one second; RER - respiratory exchange ratio; BP - blood pressure; HR - resting heart rate; p - level of significant; VO2max - maximal oxygen uptake

**Table 2.** Quality assessment and risk of bias of the included studies

Authors	Selection bias	Study design	Confounders	Blinding	Data collection method	Withdrawals and dropout	Overall rating
Bhutkar et al., 2011	M	M	M	W	S	S	M
Singh et al., 2017	S	S	S	W	S	S	M
Mangaonkar & Puntambekar, 2018	W	S	S	W	S	W	W
Kaur, 2021	S	M	M	M	S	S	S
Kodidala et al., 2021	W	M	M	M	S	S	M
Chawla et al., 2022	M	S	W	M	S	S	M
Karasugi et al., 2023	M	M	M	W	S	S	M
Raja, 2023	M	M	S	M	S	W	M
Dubey & Choudhary, 2024	W	S	W	M	S	S	W
Suwannakul et al., 2024	M	S	S	M	S	S	S
Balaji et al., 2024	W	S	W	W	S	S	W

S – strong; M– moderate; W – weak

per week over 24 weeks. Furthermore, for the session, the minimum time was five minutes, and the maximum time was 60 minutes. Information about the length of holding posture was only reported in three studies (Balaji et al., 2024; Dubey & Choudhary, 2024; Mangaonkar & Puntambekar, 2018). Only five of the 11 studies described the cycle of SN intervention in detail (Bhutkar et al., 2011; Chawla et al., 2022; Dubey & Choudhary, 2024; Karasugi et al., 2023; Mangaonkar & Puntambekar, 2018) while the remaining studies did not report the cycle of SN intervention. Among the five studies, the intervention group practiced at least three cycles per session and a maximum of 24 cycles.

### Study Outcomes

So, the present review considered the overall health and wellness outcomes confined to three broad domains, i.e., physical fitness, physiological health, and psychological health of healthy adults. The experimental studies that included Surya Namaskar (SN) as independent variable and physical fitness components such as flexibility, strength, speed, coordination; physiological health such as cardiorespiratory fitness (tidal volume, inspiratory capacity, vital capacity,

maximum ventilatory volume, forced expiratory volume in one second, peak expiratory flow rate), body mass index, resting heart rate, blood pressure, maximal oxygen uptake (VO<sub>2</sub>max), oxygen consumption, body fat percentage, lean body mass, waist-hip ratio, sleep quality; and psychological health such as perceived stress, depression, general wellbeing; and cognitive functions such as attention and orientation, memory, fluency, and visuospatial as dependent variables have been considered for present systematic review. Based on inclusion and exclusion criteria, 11 studies were analyzed. Out of 11 studies, only eight studies (73%) considered physical fitness variables such as strength (upper body muscle strength, lower body muscle strength, and grip strength), speed, endurance, flexibility (trunk, back, hamstring, upper and lower limb), coordination, and lumbar flexion, and all studies found significant improvement at the 0.05 level (Balaji et al., 2024; Bhutkar et al., 2011; Dubey & Choudhary, 2024; Karasugi et al., 2023; Kaur, 2021; Mangaonkar & Puntambekar, 2018; Raja, 2023; Suwannakul et al., 2024) while two studies (Bhutkar et al., 2011; Karasugi et al., 2023) found improvement at the 0.001 level. Furthermore, only five studies out of 11 (45%) considered physiological and cardiorespiratory fitness variables (tidal volume, inspiratory

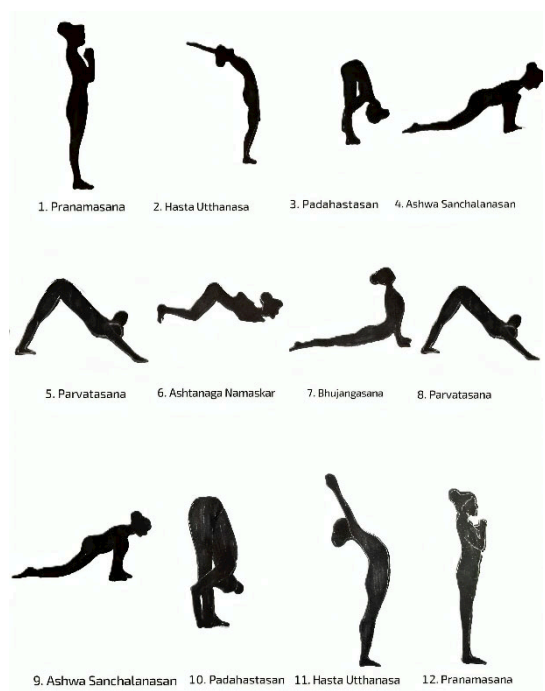


Fig. 2. Surya Namaskar: postures and sequence

capacity, vital capacity, maximum ventilatory volume, forced expiratory volume in one second, peak expiratory flow rate, maximal oxygen uptake, oxygen consumption), body mass index, resting heart rate, blood pressure, body fat percentage, lean body mass, waist-hip ratio, and sleep quality, significant improvement was observed in all parameters among the studies (100%) (Bhutkar et al., 2011; Chawla et al., 2022; Kodidala et al., 2021; Singh et al., 2017; Suwannakul et al., 2024). In the current review, psychological variables were considered by three studies, and all studies found significant improvement in depression, perceived stress, and general well-being (Chawla et al., 2022; Raja, 2023; Suwannakul et al., 2024). Furthermore, among those, one study (9%) reported significant improvement (100%) in cognitive functions such as attention and orientation, memory, fluency, and visuospatial (Kodidala et al., 2021).

#### Quality Assessment and Risk of Bias

The quality of the included studies was assessed by the Quality Assessment Tool for Quantitative Studies and revealed that two studies were of strong quality, six were of moderate, and the remaining three were of weak quality. The results are depicted in Table 2.

#### Discussion

The current review aimed to synthesize and analyze updated experimental studies on the impact of Surya Namaskar (SN) on the overall health and wellness of healthy adults. Following an extensive search across five databases, 11 articles were selected for inclusion. All studies employed SN practice as a treatment protocol, with two studies including more than one experimental group (SN). The intervention durations varied widely, ranging from

four weeks to 24 weeks, with frequencies of three to seven sessions per week. The dependent variables were grouped into three domains: physical fitness, physiological health, and psychological well-being.

#### Physical Fitness Domain

Out of eight studies addressing physical fitness, five specifically examined flexibility as a dependent variable (Balaji et al., 2024; Dubey & Choudhary, 2024; Karasugi et al., 2023; Kaur, 2021; Mangaonkar & Puntambekar, 2018). All five reported significant improvements, attributed to the dynamic flow of 12 asanas in SN that alternately stretch and contract various muscles. Key postures, such as Padahastasana (Hand-to-Foot Pose), Ashwa Sanchalanasana (Equestrian Pose), and Bhujangasana (Cobra Pose), were particularly effective in enhancing flexibility (Geetanjali et al., 2023; Hipparagi & Gangadhar, 2019). SN involves a combination of forward and backward bending postures, which engage and stretch muscles, and joints in the arms, shoulders, legs, and core. This stretching includes flexibility while the weight-bearing aspects (plank position) strengthen the muscles. From a physical health perspective, regular practice of SN enhances blood circulation and muscle functioning in various joints and stimulates various internal organs, which helps to increase muscle endurance and improve the range of motion in joints, reducing the risk of injury (Balaji et al., 2024; Bhutkar et al., 2011; Dubey & Choudhary, 2024).

Three studies investigated the effect of SN on strength, reporting significant improvements in upper-body and core strength due to weight-bearing postures such as Ashtanga Namaskara (Eight-Limbed Pose) and Bhujangasana (Bhutkar et al., 2011; Kaur, 2021; Suwannakul et al., 2024). These asanas involve isometric contractions, engaging muscles such as the pectoralis major, deltoid, biceps brachii, triceps brachii, and rectus abdominis. This suggests that SN offers benefits comparable to resistance training. Additionally, one study reported improvements in speed and coordination after six weeks of practice, although detailed mechanisms were not provided (Kaur, 2021).

#### Physiological Domain

The dynamic and repetitive nature of SN raises the resting heart rate, and blood pressure leading to cardiorespiratory fitness. By synchronizing the controlled breathing and dynamic movement, practitioners achieve enhanced oxygen uptake ( $VO_{2max}$ ), improve aerobic capacity and fitness, promote heart health and increase the efficiency of the cardiovascular system (Malhotra et al., 2023). Two out of three studies focused specifically on cardiorespiratory health, noting enhanced aerobic capacity, improved oxygen exchange, and strengthened respiratory muscles (Kodidala et al., 2021; Singh et al., 2017). This is attributed to the deep inhalation and exhalation techniques that increase oxygen exchange in the lungs, strengthening the diaphragm and improving overall respiratory health (Bhutkar et al., 2008; Hipparagi & Gangadhar, 2019). Further, the movement of abdominal muscles during poses like Bhujangasana (Cobra pose) and Uttanasana (Forward bend) stimulates the digestive system (Kumari et al., 2022). SN also regulate endocrine functions. The posture involves stretching and

compressing various glands in the body, such as the thyroid, pituitary, and adrenal glands, which can stabilize hormone levels. This movement also stimulates the nervous system and promotes hormone secretion (Geetanjali et al., 2023; Kumari et al., 2022; Venkatesh & Vandhana, 2022).

SN also positively influences metabolic health, with studies showing improved insulin sensitivity, glucose metabolism, and fat-burning processes (Hipparagi & Gangadhar, 2019; Mody, 2011). Regular practice helps regulate blood sugar levels, reducing the risk of metabolic disorders such as type 2 diabetes. Moreover, several studies highlighted reductions in blood pressure and heart rate, linked to enhanced vagal tone and reduced sympathetic discharge (Chawla et al., 2022; Kodidala et al., 2021). The calming effect of SN's rhythmic breathing further reduces cortisol levels, promoting relaxation and improved cardiovascular health (Pal et al., 2024).

SN's impact extends to sleep quality, with one study reporting significant improvements attributed to reduced cortisol levels and muscle relaxation through sustained practice (Chawla et al., 2022). This highlights SN's potential to alleviate physiological arousal and foster restorative sleep.

### *Psychological Domain*

The meditative and rhythmic nature of SN contributes to enhanced mental health and wellness. Among three studies addressing the psychological domain, significant reductions in perceived stress (Suwannakul et al., 2024) and depression (Raja, 2023) were observed. Research suggests that SN stimulates the parasympathetic nervous system (responsible for relaxation and recovery) while calming the sympathetic nervous system (responsible for stress and the 'fight or flight' response) and promotes mental clarity (Raja, 2023; Stec et al., 2023; Suwannakul et al., 2024). SN stimulates endorphins, often referred to as "feel-good hormones," which elevate mood and create a sense of well-being. This is particularly effective in mild depression and reduces anxiety by lowering the level of cortisol (the stress hormone), enhancing emotional stability, and making it a holistic practice for promoting psychological health (Joshi et al., 2022). Research study shows that regular practice of SN has been shown to improve focus, memory, mindfulness, attention, orientation, fluency, visuospatial, and overall cognitive function by increasing the flow of oxygen-rich blood to the brain (Kodidala et al., 2021). Also, studies have demonstrated that SN can help sharpen mental faculties and decision-making skills (Mody, 2011).

A comprehensive narrative review of research conducted by Netke and Shegokar (2024) highlights numerous health benefits associated with SN, such as improved cardiovascular health, flexibility, stress reduction, and weight loss (Netke & Shegokar, 2024). The review identified that regular practice of SN enhances cognitive functions, reduces cortisol levels, and improves hormone balance, which positively influences both physical and psychological well-being (Netke & Shegokar, 2024). Furthermore, a comprehensive preliminary review of 87 articles revealed that SN has been extensively studied for its physiological, psychological, and health-related benefits, with an increasing number of publications in recent years (Das, 2023). Another review conducted by Venkatesh and Vandhana (2022) accentuates

the importance of SN, highlighting its effect on physical, physiological, and psychological aspects of the body, and proposes that SN practice could be a group activity of the family (Venkatesh & Vandhana, 2022). Also, enlighten the benefits of SN practice has a positive effect on puberty, the menstrual cycle, and childbirth. Overall, the findings of the present systematic review showed that SN provides a comprehensive workout for the body, mind, and spirit, and its combination of breathwork, movement, and mindfulness cultivates physical fitness, enhances physiological processes, manages psychological health and improves cognitive functions, making it a highly effective practice for improving overall health and well-being. Sushika and Ashwitha (2024) found a strong correlation between SN practice and human health that showed sparing a 10-minute per day SN practice can cause a dramatic change in the human life (Sushitha & Ashwitha, 2024).

### *Study Limitation*

This review acknowledges several limitations within the included studies, such as heterogeneity in the age of healthy adults, sample sizes, intervention protocols (especially the total duration, frequency per week, and the number of cycles per session), and follow-up durations. The present review was conducted on the articles that were published in the last 14 years (2011-2024). The studies published in English were only included, and thereby the study might have publication bias. The current review could not include a large number of randomized controlled trials due to their unavailability, and also the quality of the included studies was not strong. Future experimental research should focus on standardizing intervention designs and exploring long-term effects to establish more robust conclusions.

### *Strength and Practical Implication*

The present systematic review considered the studies that were conducted only on healthy adults. The current review was focused on the effect of only the SN intervention. Moreover, the current review included studies that covered a wide range of physical, physiological, and psychological variables that can correctly signify the overall health and wellness status of the adult population. Moreover, this is the first and only systematic review that focused on the impact of a very well-known and well-practiced yogic posture, SN. The critical analysis of the empirical evidence revealed that the sun salutation, a short-duration sequential posture execution, is really worthy for maintaining good flexibility, balance, and postural alignment and provides many more physiological benefits. Further, this postural sequence can be practiced within a very small space in a home setting, which will add additional feasibility for the busy individual.

### **Conclusion**

Based on the availability of experimental studies and within the limitations, it may be concluded that the practice of Surya Namaskar is conducive for overall health and wellness of healthy adults. Further, this yogic Sun salutation is a time-honored practice that integrates physical postures, breathing techniques, and mindfulness, offering a comprehensive

approach to health and wellness. In the modern era, where sedentary lifestyles are prevalent, SN provides an accessible and effective means of improving physical fitness that incorporates flexibility, strength, and coordination while promoting mental calmness that may contribute to lowering the level of anxiety, depression, and perceived stress and improving cognitive functions, thereby enhancing general well-being. Regular practice has been shown to positively impact the cardiorespiratory fitness which includes vital capacity, tidal volume, oxygen consumption, and other lung functions making it a practical alternative to traditional forms of exercise. Further SN has a significant impact on physiological health that considers metabolic health, cardiac health, and sleep quality. Its adaptability for various fitness levels and minimal space requirements make it suitable for busy individuals seeking to maintain overall well-being. As evidence supports its multifaceted benefits, SN stands as a valuable tool for promoting holistic health in healthy adults amidst the challenges of contemporary living.

### Conflict of Interest

The authors declare that there is no conflict of interest.

### References

- Bussing, A., Michalsen, A., Khalsa, S. B. S., Telles, S., & Sherman, K. J. (2012). Effects of Yoga on Mental and Physical Health: A Short Summary of Reviews. *Evidence-Based Complementary and Alternative Medicine*, 2012(1), 165410. <https://doi.org/10.1155/2012/165410>
- Sengupta, P. (2012). Health Impacts of Yoga and Pranayama: A State-of-the-Art Review. *International Journal of Preventive Medicine*, 3(7), 444–458.
- Johnston, E. F. (2023). “7: “You Are Not the Body”: (Re) Interpreting the Body in and through Integral Yoga”. In *Interpreting the Body*. Bristol, UK: Bristol University Press. (pp. 155–177). <https://doi.org/10.51952/9781529211580.ch007>
- Paramashiva, P. S., K. A., K. V., K.n., S., Chandrasekaran, B., Reddy, G. G., Sukumar, S., Ravichandran, S., Shettigar, D., Muthu, S. S., & Kadavigere, R. (2024). Impact of a six-month yoga intervention on cognitive performance among desk-based workers: An interrupted time-series design. *Advances in Integrative Medicine*. <https://doi.org/10.1016/j.aimed.2024.12.001>
- Telles, S., Sharma, S. K., Chetry, D., & Balkrishna, A. (2021). Benefits and adverse effects associated with yoga practice: A cross-sectional survey from India. *Complementary Therapies in Medicine*, 57, 102644. <https://doi.org/10.1016/j.ctim.2020.102644>
- Devi, G., K. V., S. K. A., Devi, B. B., & Singh, J. (2024). Effect of Suryanamaskara and Heating Pranayama on Grade 1 Obesity—A Randomized Controlled Trial. *Journal of Ayurveda and Integrated Medical Sciences*, 9(1), 23-31. <https://doi.org/10.21760/jajms.9.1.3>
- Mondal, S., Kundu, B., & Saha, S. (2018). Yoga as a Therapeutic Intervention for the Management of Type 2 Diabetes Mellitus. *International Journal of Yoga*, 11(2), 129-138. [https://doi.org/10.4103/ijoy.IJOY\\_74\\_16](https://doi.org/10.4103/ijoy.IJOY_74_16)
- Parajuli, N., Shindhe, M., & Pradhan, B. (2023). Effect of Surya Namaskara (Sun Salutation) on mental health, self-control and mindfulness of adolescent school children. *Complementary Therapies in Clinical Practice*, 50, 101691. <https://doi.org/10.1016/j.ctcp.2022.101691>
- Kumar Singhal, H. (2023). Clinical Study on Dashanga Guggulu and Surya Namaskar in the Management of Sthaulya (Obesity) In Children. *Orthopedics and Rheumatology Open Access Journal*, 22(2), 1-15. <https://doi.org/10.19080/OROAJ.2023.22.556083>
- Hipparagi, M., & Gangadhar, P. (2019). Suryanamaskar for human wellness. *International Journal of Physical Education, Sports and Health*, 6(4), 81–84.
- Sinha, B., & Sinha, T. D. (2014). Effect of 11 months of yoga training on cardiorespiratory responses during the actual practice of Surya Namaskar. *International Journal of Yoga*, 7(1), 72-75. <https://doi.org/10.4103/0973-6131.123493>
- Mody, B. S. (2011). Acute effects of Surya Namaskar on the cardiovascular & metabolic system. *Journal of Bodywork and Movement Therapies*, 15(3), 343-347. <https://doi.org/10.1016/j.jbmt.2010.05.001>
- Bhandage, V., Prabhu, S., Hadimani, B. S., Chadaga, K., Sampathila, N., & Shetty, S. (2024). Classification of Surya Namaskar Yoga Asanas: A Sequential Combination of Predominant Poses for Physical and Mental Health. *IEEE Access*, 12, 102027-102034. [IEEE Access](https://doi.org/10.1109/ACCESS.2024.3429569). <https://doi.org/10.1109/ACCESS.2024.3429569>
- Krishma, A. (2024). Effect of Suryanamaskar Practice on Skin Microbiome in Healthy Individuals—An Exploratory Clinical Study. *Annals of Medical and Health Sciences Research*, 14(03), 945-952.
- Suwannakul, B., Sangkarit, N., Thammachai, A., & Tapanya, W. (2024). Effects of Surya Namaskar yoga on perceived stress, anthropometric parameters, and physical fitness in overweight and obese female university students: A randomized controlled trial. *Hong Kong Physiotherapy Journal*, 1-11. <https://doi.org/10.1142/S1013702525500027>
- Kumari, P., Reddy, K. R. C., Yadav, R., & Vinay, K. H. C. and K. (2022). Impact of sun salutation in human body. *World Journal of Pharmaceutical and Medical Research*, 8(12), 80-83.
- Pal, R., Rao, S., Deo, G., Basavaraddi, I. V., Sharma, N., & Madaan, L. (2024). Impacts of the Surya Namaskar on Body Composition and Physiological Parameters among Yoga and Non Yoga Professionals: A Quasi-experimental Study. *Journal of Clinical and Diagnostic Research*, 18(2), 11-15. <https://doi.org/10.7860/JCDR/2024/66733.19043>
- Venkatesh, L. P., & Vandhana, S. (2022). Insights on Surya namaskar from its origin to application towards health. *Journal of Ayurveda and Integrative Medicine*, 13(2), 1-9. <https://doi.org/10.1016/j.jaim.2021.10.002>
- Stec, K., Kruszewski, M., & Ciechanowski, L. (2023). Effects of Suryanamaskar, an Intensive Yoga Exercise Routine, on the Stress Levels and Emotional Intelligence of Indian Students. *International Journal of Environmental Research and Public Health*, 20(4), 2845. <https://doi.org/10.3390/ijerph20042845>
- Bandyopadhyay, N., Das, T., Biswas, A., & Koley, A. (2023). Effects of Yogic Intervention on Sleep Quality of Healthy Elderly: A Systematic Review. *Universal Journal of Public Health*, 11(1), 78-88. <https://doi.org/10.13189/ujph.2023.110109>

- Suri, P., Khanna, N., & Basu Ray, I. (2025). *Chapter 31—Role of yoga in cardiovascular disease prevention in the Indian population*. In I. Basu-Ray (Ed.), *Yoga for Cardiovascular Disease and Rehabilitation* (pp. 489–505). Academic Press. <https://doi.org/10.1016/B978-0-323-99645-7.00007-X>
- Wirawan, I. G. B. (2018). Surya Namaskara Benefits for Physical Health. *International Journal of Social Sciences and Humanities (IJSSH)*, 5(2), 43-55. <https://doi.org/10.29332/ijssh.v2n1.78>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Thomas, B. H., Ciliska, D., Dobbins, M., & Micucci, S. (2004). A Process for Systematically Reviewing the Literature: Providing the Research Evidence for Public Health Nursing Interventions. *Worldviews on Evidence-Based Nursing*, 1(3), 176-184. <https://doi.org/10.1111/j.1524-475X.2004.04006.x>
- Balaji, E., Murugavel, K., Rajkumar, M., Logeswaran, S., Vijayasankar, V., & Devaraj, C. (2024). The Effect of a Six-Week Course of Surya Namaskar Practice on Back Flexibility and Lumbar Flexion in Male College Students. *Physical Education Theory and Methodology*, 24(1), 41-46. <https://doi.org/10.17309/tmfv.2024.1.05>
- Chawla, J. K., Arya, T., Sharma, R., & Kumar, P. (2022). Effect of Suryanamaskar on the Sleep Quality and General Well-being among Young Adults: A Quasi-experimental Study. *Journal of Clinical and Diagnostic Research*, 16(10), YC06–YC09. <https://doi.org/10.7860/JCDR/2022/57340.17094>
- Dubey, S., & Choudhary, P. K. (2024). Analyzing the Musculoskeletal Flexibility in Young Females: The Impact of a Six-Week Surya Namaskar Intervention on Back Flexibility and Lumbar Flexion. *Physical Education Theory and Methodology*, 24(4), 554-561. <https://doi.org/10.17309/tmfv.2024.4.06>
- Raja, S. C. (2023). Effects of Suryanamaskar on Depression and Trunk Flexibility among Older Men. *Innovare Journal of Education*, 11(4), 25-29. <https://doi.org/10.22159/ijoe.2023v11i4.47742>
- Mangaonkar, A., & Puntambekar, A. (2018). Effect of suryanamaskar vs dynamic stretching on hamstring flexibility among physiotherapy students: A pilot study. *International Journal of Physiotherapy*, 5(6), 202-206. <https://doi.org/10.15621/ijphy/2018/v5i6/178058>
- Singh, P., Yogesh, M., Jamuna, B., & Mendonca, N. L. (2017). Comparative Study on the Effects of Surya Namaskar & Spot Jogging on Respiratory Parameters: A Pilot Study. *International Journal of Physiology*, 5(1), 139-144. <https://doi.org/10.5958/2320-608X.2017.00031.2>
- Bhutkar, M. V., Bhutkar, P. M., Taware, G. B., & Surdi, A. D. (2011). How Effective Is Sun Salutation in Improving Muscle Strength, General Body Endurance and Body Composition? *Asian Journal of Sports Medicine*, 2(4), 259-266. <https://doi.org/10.5812/asjasm.34742>
- Karasugi, N. M. A. R., Lilis, L., Amita, A. S. D., Handayani, M. D. N., & Prastowo, N. A. (2023). Effect of Surya Namaskar yoga practice on flexibility in the pre-elderly and elderly. *Journal of the Medical Sciences*, 55(4). <https://doi.org/10.19106/JMedSci005504202306>
- Kaur, R. (2021). Effect of Surya-Namaskar on the Fitness Components and its Trends. *International Research Journal of Ayurveda & Yoga*, 04(11), 21-26. <https://doi.org/10.47223/IRJAY.2021.41103>
- Kodidala, S. R., Hans, P. S. R., Sorout, J., & Soni, H. (2021). Impact of Suryanamaskar Training on Cardiovascular, Respiratory, and Cognitive Functions among Medical Students. *Avicenna Journal of Neuro Psycho Physiology*, 9(1), 1-4. <https://doi.org/10.32592/ajnpp.2022.9.1.100>
- Geetanjali, D., Sharma, D. A., & Wahane, D. A. S. (2023). The impact of surya namaskar (sun salutation) on body flexibility and endurance of healthy individual: Anatomical perspective. *World Journal of Pharmacy and Pharmaceutical Sciences*, 12(5), 851-865. <https://doi.org/10.20959/wjpps20235-24758>
- Malhotra, V., Pathak, T., Javed, D., Wakode, S., Thakare, A., Shrivastava, R., Chouhan, S., & Filho, F. J. C. (2023). Comparative Analysis of Heart Rate Variability Parameters between Surya Namaskar and Stationary Bike Exercise Groups. *International Journal of Yoga*, 16(3), 202-209. [https://doi.org/10.4103/ijoy.ijoy\\_172\\_23](https://doi.org/10.4103/ijoy.ijoy_172_23)
- Bhutkar, P., Bhutkar, M. V., Taware, G. B., & Doddamani, B. R. (2008). Effect of Suryanamaskar Practice on Cardio-respiratory Fitness Parameters: A Pilot Study. *Al Ameen Journal of Medical Sciences*, 01(2), 126-129.
- Joshi, S. J., Khan, S. N., Kantharia, J. S., Mhase, S., Pashine, A. A., Umate, R., Joshi, S., Khan, S. N., Kantharia, J. S., Mhase, S., Pashine, A. A., & Umate, R. (2022). A Pragmatic Comparison Between Aerobic Exercise and Suryanamaskar in Stress Management in Medical Professionals: A Quasi-experimental Study. *Cureus*, 14(9), e29414. <https://doi.org/10.7759/cureus.29414>
- Netke, A., & Shegokar, N. (2024). A Comprehensive Narrative Review of Surya Namaskar and Associated Health Benefits. *International Journal For Multidisciplinary Research*, 6(4), 25329. <https://doi.org/10.36948/ijfmr.2024.v06i04.25329>
- Das, D. P. (2023). Suryanamaskara is an Effective Practice for Overall Health Management: A Preliminary Review Study. *International Journal of Social Science And Human Research*, 06(01), 707-714. <https://doi.org/10.47191/ijsshr/v6-i1-94>
- Sushitha, S., & Ashwitha, K. (2024). *The Impact of Surya Namaskar on Human Health Factors—An Empirical Bivariate Analysis*. In A. Joshi, M. Mahmud, R. G. Ragel, & S. Kartik (Eds.), *ICT: Applications and Social Interfaces* (pp. 43–51). Springer Nature. [https://doi.org/10.1007/978-981-97-0210-7\\_4](https://doi.org/10.1007/978-981-97-0210-7_4)

# Практикування Сур'я-намаскара: Послідовність йогічних поз для підтримки загального стану здоров'я та благополуччя серед здорових дорослих осіб

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 10 с., 2 табл., 2 рис., 41 джерело

**Історія питання.** Йога, стародавня практика, що сягає корінням у індійську культуру, здобула світове визнання завдяки своїм перевагам щодо зміцнення фізичного та психічного здоров'я. Серед практик йоги варто відзначити методику Сур'я-намаскара (СН) — комплекс йогічних вправ «Вітання Сонцю», що представляє собою комбінацію визначених положень тіла, дихання та розвиток усвідомленості, сприяючи фізичній життєздатності, душевному спокою та практичному вирішенню проблем, пов'язаних із сучасним малорухливим способом життя.

**Мета дослідження.** Метою цього систематичного огляду було проаналізувати вплив СН на загальний стан здоров'я та благополуччя здорового дорослого населення.

**Матеріали та методи.** Проведено комплексний пошук у п'яти основних наукометричних базах даних, а саме: Scopus, PubMed, PubMed Central, Web of Science та ScienceDirect, використовуючи терміни, як-от «Сур'я-намаскара», «Вітання Сонцю», «Сур'я-намаскара і фізична підготовленість», «Сур'я-намаскара для дорослих осіб», «Вітання Сонцю для підтримки загального стану здоров'я та благополуччя», а також «Сур'я-намаскара і гіподинамія». У рамках цього наукового огляду розглядалися статті, опубліковані англійською мовою в період з 2011 по 2024 рік. Систематичний пошук і звітування проводились згідно з рекомендаціями «Переважні елементи звітування для систематичних оглядів та метааналізів» (PRISMA). Для аналізу методологічної якості включених статей використовувався інструмент оцінки якості кількісних досліджень (Quality Assessment Tool for Quantitative Studies).

**Результати.** На основі критеріїв включення та виключення на початковому етапі було відібрано 117 статей, з яких остаточно було включено 11 наукових публікацій, що стосувалися даних щодо 445 здорових дорослих осіб з трьох країн віком від 18 до 65 років. Тривалість інтервенції із застосуванням комплексу вправ СН варіювалася від 4 до 24 тижнів, з частотою сеансів від 3 днів на тиждень до щоденних занять, а також з різною кількістю циклів. Аналіз методологічної якості показав, що дві статті мали високий рівень якості, шість — помірний, а решта три — низький.

**Висновки.** У цьому систематичному огляді обґрунтовано висновок, що застосування практики, яка передбачає виконання комплексу йогічних вправ «Вітання Сонцю» (Сур'я-намаскара) позитивно впливає на покращення та підтримання фізичної підготовленості, фізіологічного здоров'я та психологічного благополуччя, які визначають загальний стан здоров'я та благополуччя здорового дорослого населення.

**Ключові слова:** Вітання Сонцю, громадське здоров'я, загальне самопочуття, йога, доросле населення.

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