Role of *Surya Namaskar* in improving strength, flexibility and diseases of various biological system

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**Abstract**

Thousands of years ago, the great “Patanjali” and his disciples created the *Surya Namaskara*, a traditional yoga practise to salute the Sun. Surya means "Sun" and Namaskara means "Salutation" or "to greet." They advised everyone to practise it early in the morning, on an empty stomach, facing the rising sun, for optimum health, endurance, mental and physical stability, and strength. *Pranamasana*, *Hasta Uttanasana*, *Hastapaadasana*, *Ashwa SanchalanaParvatasan*, *Adho Mukha Svanasan*, *Bhujangasana*, *Adho Mukha Svanasana*, *Parvatasana*, *Ashwa Sanchalanasana*, *Hastapaadasana Swadhisthana*, *Hasta Uttanasana*, and *Pranamasana*. Anahata all poses are among the sequences of 12 dynamically coordinated yoga positions known as *Suryanamaskar* that are performed in rhythm with the breath. The benefits of *Surya Namaskar* are numerous. This review is therefore carried out in order to assemble and comprehend the impact of *Suryanamaskar* on distinct bodily systems. In this review, published publications were located using search engines such as MEDLINE, EMBASE, Scopus, Science Direct Databases Directory of Open Access Journals (DOAJ), PubMed, and Google Scholar. According to research, *Surya namaskar* increases physical strength, promotes healthy skin and respiratory muscles, treats premenstrual syndrome symptoms, lowers the risk of high-risk pregnancy, reduces seminal oxidative stress and oxidative DNA damage, and improves sperm motility in men. It also lowers high glucose levels, stress, flatulence, body weight constipation, and high blood pressure and improves flexibility of the body.

**Keywords:** *Surya Namaskar*, biological system, yoga, sickness, treatment and mechanism
Introduction

With its roots in the Indus Valley civilization in the northwest of India, yoga is thought to be 4000–8000 years old[1]. The Sanskrit word yuj, which means "to connect," is the root of the word yoga, which means "unity or oneness"[2]. The oldest sacred text of Brahmanism, the Rig Veda, which served as the foundation for contemporary Hinduism, first made reference to yoga around 1500 B.C.E.[2]. Prior to this, it is thought that sages kept yoga practices a secret and never recorded them[2]. Yoga was regarded as a method of living that would enable a person to become liberated from suffering in the Upanishads (800–500 B.C.E.)[2]. Yoga is also a integral part of Ayurveda, an ancient Indian system of medicine, with time-tested experiential evidence to cure various disorders[3], [4], [5]. The concept of yoga has grown to include a vast range of disciplines, philosophies, and practices via succeeding historical periods, texts, and teachers. Hatha yoga is the most well-known and recognisable type of yoga, particularly in the West[2]. The yoga practise known as Surya Namaskar is focused on improving both physical and mental wellness[2]. The Surya Namaskar is a comprehensive physical practise that was allegedly created and popularised by the late Shrimant Balasaheb Pant Pratinidhi, the King of Aundh, in the 1920s and later by Sri K V Iyer and Sri Krishnamacharya[6]. The Surya namaskar models put forward by Sri Krishnamacharya were discovered to be based on the Danda exercises described in Vyayama Dipika[7]. Dandaal is an old form of physical training that is still used today by wrestlers and martial artists in India. Dandaal may have been the source of the push ups utilised in western countries for bodybuilding[6]. Surya namaskar is considered to be the precursor to modern physical exercises because it is a traditional fusion of two different systems, such as physical culture and yoga[6]. Other yoga schools, such as the Swami Sivananda Yoga Vedanta Center, the Bihar School of Yoga (BSY), and the Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA), adopted further simplified versions, which were gradually absorbed into contemporary yogic practices[7].

Surya Namaskar is a traditional yoga practise to praise the Sun. As a result, it is also known as Sun Salutation or Surya Namaskar. This particular breathing and postural regimen was created by the great "Patanjali" and his or her disciples thousands of years ago[8]. They encouraged all people to perform it in the morning in front of the rising sun, facing towards the sun on an empty stomach, for excellent health, stamina, mental and physical stability, and strength[9]. Suryanamaskar is a series of dynamically coordinated yoga poses that are performed in time with the breath. Surya namaskar is a set of 12 physical postures that include several bends both forward and backward[2].

Surya Namaskar consists of 12 various asanas (poses) in sequences, including Pranamasana, Hasta Uttanasana, Hastapaadasana, Ashwa Sanchalana, Adho Mukha Svanasana / Parvatasana Ashtanga Namaskara, Bhujangasana, Adho Mukha Svanasana / Parvatasana, Ashwa Sanchalanasana, Hastapaadasana, Swadhisthana, Hasta Uttanasana, Pranamasana Anahata. Surya Namaskar has numerous additional advantages because it is best performed while facing the rising sun. This allows our bodies to absorb the vitamin D that the sun's rays contain, which strengthens our bones and improves our vision[10]. Yoga's therapeutic benefits are also being investigated as a result of growing scientific studies on various
health disorders and treatment regimens based on human constitution[11]. The advantages span a variety of physical health systems and include psychological safety via aerobic conditioning under the sun[10].

Studies on the effects of Surya Namaskara on physiological and psychological parameters suggest that by performing these asanas, the abdominal muscles get stretched and compressed, stimulates peristaltic movements of the intestines helping to remove excess gas and constipation, stimulates blood circulation to the spinal canal, brain, and stretched and contracted whole musculoskeletal system, gives the body additional strength and flexibility, revitalises every cell and tissue, increases upper body strength through the naturally occurring weight bearing poses, especially in the arms and shoulders, tones and stimulates essential organs, promotes physical strength, flexibility, and mental calmness[9]. Increase skin glow because perspiration cleans the skin's pores, improve contractility of the respiratory system and vital capacity, balance the entire endocrine system by directly massaging the glands with increased blood flow, increase myocardial contractility and strength, increase cardiac output, ventilate the lungs and oxygenate the blood thoroughly, gives one's body strength, flexibility of their muscles, especially their legs, backs, chests, and buttocks, mental peace, helps them reduce extra body fat, loosens up their joints, and tones their muscles, helps all our internal organs function better and combat insomnia, regulate menstrual cycles and makes childbirth easier[9]. Additionally, Surya Namaskara has a tendency to activate the Pingala nadi (Surya nadi), which raises the body's energy level[8]. Improvements in pulmonary function, including peak expiratory flow rate, forced vital capacity, forced expiratory volume in 1 second (FEV1), and maximal inspiratory and expiratory pressures, have been shown. Following frequent Surya namaskar practise, decreased levels of biomarkers for oxidative stress have been seen coupled with improved glucose tolerance[12][13]. Among the advantages of Surya namaskar intervention are increased muscular mass and decreased fat mass[14]. When comparing baseline to the ninth posture, Sinha et al. (2004) found a 2.711 kcal/min increase in energy expenditure, drawing the conclusion that Surya namaskar is the best aerobic workout with an optimal stress on the cardiorespiratory system[15].

Previous studies have revealed kinetics, kinematics, and muscle activation during standing yoga asanas in senior people with regard to the biomechanical demands of these poses[16]. The joint moment of force in the sagittal plane was reduced by 30% to 268% during supported asanas due to the graduated biomechanical stress caused by starting with supported asanas and working up to typical unsupported tree pose, warrior stance, dog posture, and chair pose[16]. Supported asanas, on the other hand, resulted in reduced muscle activity, whereas traditionally performed asanas, on the other hand, resulted in higher muscle activity and, as a result, higher joint moments, which were, however, low to moderate[16]. Most standing poses worked the quadriceps femoris, gluteus medius, and erector spinae, and produced 70% more rectus abdominis activity than walking did[16]. Regarding Surya namaskar's biomechanics, the fluid rhythmic kinematic transition from one position to the next as well mathematical model to predict loads on the wrist, elbow, shoulder, hip, knee, and ankle joints are also reported[17]. The description of low loading forces applied in particular distribution patterns leads to the conclusion that none of the joints are
overloaded during *Surya namaskar*. Clinical measurements are also used to describe improvements in fatigue, balance, gait speed, and stride length[18].

The influence of *Surya namaskar* in various organs, specifically in regard to the mechanistic role it plays, is thought to be the subject of no published reviews to date. Thus, this study examines the role of Surya namaskar in promoting diseases of several body systems. Review's objective was to present scientific evidence supporting *Surya namaskar*’s management of life's diseases. The current review will contribute to a better knowledge of how *Surya namaskar* affects specific organs.

1. **Methodology**

MEDLINE, EMBASE, Scopus, Science Direct Databases Directory of Open Access Journals (DOAJ), PubMed, and Google Scholar were utilised as search engines to find published articles. Surya Namaskar, yoga, sickness, treatment, and mechanism were used as key terms along with the conjunctions OR/AND. The language of searches was limited to English. Research studies describing the management of life disorders using Surya namaskar. Conference proceedings, letters to the editor, grey literature, previously unpublished data, news items, abstracts and full texts that couldn't be retrieved, research published in languages other than English, and studies that weren't pertinent to the current review weren't included.

2. **Discussion**

Figure 1: Effects of Surya namaskar on various systems
A) Effect of Surya namaskar on flexibility

Reduced flexibility can be caused by a number of things, including a desk job, a sedentary lifestyle, or fat buildup around joints, which limits full range of motion. Various factors are involved for reduced or altered functioning of skeletal muscles[19]. Various biomechanical alterations in joints and changed postures can result from changes in flexibility. So, in order to carry out daily tasks with ease, flexibility is required. Maintaining flexibility may aid in reducing stress and stiffness, which can result in physical issues that are persistent and frequently crippling[20]. The series mimicked push-up movement and weight-bearing positions for the upper body may aid in building pectoral, triceps, and trunk muscles with greater strength and endurance[21]. The sequence offers such a significant physical stretch that it is regarded as constituting a whole yoga practise in and of itself[8].

Muscle flexibility is defined as the ability to move a single joint or series of joints smoothly and easily through an unrestricted, pain-free range of motion[22]. Hamstring is a two joint muscle which contracts eccentrically to maintain a proper posture in standing hence are prone to be tight. Hamstrings are an example of muscle groups that tend to shorten (Turner et al., 1988). A tight hamstring causes increased patellofemoral compressive force, which may eventually lead to patellofemoral syndrome[23]. Hamstring tightness can also lead to altered gait patterns that are inadequate knee extension at initial contact and overuse injuries. Donald E Hartig (1999) reported that increasing hamstring flexibility decreases lower extremity overuse injuries in basic military trainees[24].

The superficial back line includes the hamstrings. The entire posterior surface of the body, from the bottom of the foot to the top of the head, is connected and shielded by the superficial back line. The superficial back line performs as an uninterrupted line of integrated myofascial when the knees are extended, such as during standing. As a result, when Suryanamaskar is performed, the hamstrings are stretched via the visible back line[25].

Additionally, a study by Deshmukh et al.[20] comparing the effects of Pilates and Surya Namaskar on flexibility in sedentary women using the sit-and-reach test and the shoulder and wrist test found that Surya Namaskar is more effective at improving flexibility in sedentary women than Pilates and can be added to a daily fitness routine. In a different investigation, Anagha Mangaonkar et al. [21] examined the impact of Surya Namaskar vs. dynamic stretching on hamstring flexibility in physiotherapy students and came to the conclusion that Surya Namaskar is more efficient in enhancing hamstring flexibility than dynamic stretching. Prof. (Dr.) Kanwaljeet Singh et al study’s on the impact of Surya Namaskar yoga sadhana on yogini intercollege athletes' concludes to increase flexibility and muscular stamina.

Additionally, Ananda Balayogi Bhavnani et al. [16] 2013 investigated the immediate effects of Surya Namaskar on reaction time and heart rate in female volunteers and came to the conclusion that Surya Namaskar may be used as an efficient training method to enhance neuromuscular abilities.

Additionally, a research by Mastrengelo et al. found that Surya namaskar significantly increased menopausal women's hamstring flexibility[27]. Kanwaljeet Singh, Dr. Baljinder Singh Bal, and Dr. Wilfred Vaz conducted a similar study on the impact of Suryanamaskar on the muscular endurance and flexibility of intercollegiate yoginis.
It was established that Suryanamaskar yogasana significantly increased muscular endurance and hamstring flexibility[26]. Suryanamaskar has also been demonstrated to enhance hamstring flexibility, upper body strength, and muscle endurance in a study by Kristine Fondran[28]. The superficial front and rear lines both extend during the suryanamaskar, which causes the superficial back line to likewise constrict. Even the smallest muscles of the spinal column and the back are strengthened when the back muscles are contracted, but dynamic stretching only affects the specific muscle and joint that is being stretched. The spinal region's blood circulation is improved by suryanamaskar, which in turn stimulates the nerves there.

It proved that Suryanamaskar yogasana has a significant effect on improving muscular endurance and hamstring flexibility[26]. A study by Kristine Fondran has also proved that Suryanamaskar improves hamstring flexibility, upper body, muscle endurance and also improves overall mental health[28]. In suryanamaskar, the superficial front line also gets stretched which causes co-contraction of the superficial back line. Owing to the contraction of the muscles of the back, even the smallest muscles of the spinal column, as well as the muscles of the back, are strengthened whereas dynamic stretching affects only the targeted muscle and joint. Suryanamaskar improves blood circulation in the vertebral region, and consequently, the nerves in this region are invigorated. In addition to the hamstrings, suryanamaskar improves and maintains spinal flexibility[29]. Suryanamaskar has been shown to have beneficial physiological effects in addition to increasing flexibility by enhancing pulmonary function, respiratory pressures, hand grip strength, endurance, and resting cardiovascular parameters[12]. These are the potential explanations for why suryanamaskar performed better than dynamic stretching in this study.

**B) Effect of Suryanamaskar on Cardiovascular system**

Recent research has been done by Sinha and colleagues[15] who examined the energy costs and cardiorespiratory alterations during practice as well as Bhutkar and colleagues[30] who did a pilot study on the cardiorespiratory fitness parameters after practicing Suryanamaskar for six months. Reduced catecholamine secretion and vasodilation brought on by decreased sympathetic activity enhance peripheral circulation. Regular yoga practice is also found to lower basal metabolic rate and oxygen consumption while at rest[31]. The drop-in resting pulse rate could be caused by all of these. These variables also lessen the strain on the heart, which in turn lowers cardiac output and, ultimately, systolic blood pressure[31].

The best kind of aerobic exercise, according to Sinha and colleagues, is Suryanamaskar, which involves all major joints in static, stretching, and dynamic muscular movements[9]. The Suryanamaskar technique varies among many schools of yoga. Some schools promote slow performance in sync with slow breathing, while others promote a speedy style of performing numerous rounds quickly, much like physical training. It has been said that performing Suryanamaskar at various speeds has various advantages that when it is done rapidly it warms up the body and acts as a cardio tonic, whereas when done slowly it strengthens and tones the musculature and enhances functioning of internal organs[12]. During Suryanamaskar, muscles of the entire body experience stretch and pressure alternately and therefore it is said to give more benefits with less expenditure of time[30].
Additionally, *Surya namaskar* was found to significantly lower blood pressure in studies by McCaffrey et al. [32] and Blank[33] that looked at the effectiveness of an 8-week yoga programme in a group of hypertensive patients in Thailand and the physiological responses to Iyengar Yoga practised by trained practitioners respectively.

Also, McCaffrey et al. [32] who examined the effectiveness of an 8 week yoga program in a group of hypertensive patients in Thailand, as well as Blank8 [33] who studied the physiological responses to Iyengar Yoga, as performed by trained practitioners, found a significant decrease in blood pressure with intervention of *Surya namaskar*.

**C) Suryanamaskar effect on stress**

Homeostasis requires stress to be maintained, but when stress overwhelms a person or disrupts homeostasis, it can be dangerous[34]. The neurological system is stimulated by stress, which also overworks the adrenal glands and reduces immunity[35]. The parasympathetic and sympathetic nervous systems become unbalanced during stress, which affects the body's equilibrium and, ultimately, quality of life[34]. The need to create solutions that can lower stress levels among young people is quite high due to the increase in the number of young people suffering from mental health issues and the difficult lives they lead[35]. One such tool may be considered to be yoga[36]. You may confront overwhelming anxieties, frustrations, and problems in daily life by using the inner strength that yoga teaches you to access[37].

Yoga has been shown to be an effective intervention for college students in enhancing psychological factors including sense of wellbeing and feeling relaxed, to mention a few[38]. Yoga and relaxation techniques have been shown to lower stress and competitive anxiety while boosting mental toughness, according to a study[39].

It has also been suggested that one can drive away depression through fast rounds or cool down hyperactivity with slow rounds [40] It is an ideal way to relax the mind as it uses the whole body and produces sweating. This can lead to great burn off anger and allow to calmly dealing the situation with full of awareness.

Additionally, it increases the volume of the frontal cortex, which is linked to impulse control and self-regulation[41][42]. Studies have shown that willpower, executive function, delay of gratification, self-regulation, and executive control all of which are primarily under the direction of the frontal cortex make up the high-level function of self-control [36][38]. Therefore, a proposed reason for the improvement in self-control following *Suryanamaskar* intervention could be an increase in the frontal lobe of the brain's volume.

Yoga intervention greatly promotes mindfulness, according to earlier research by Gaiswinkler & Unterrainer, Erkin & Senzuzun Aykar, and Brisbon & Lowery[43][44][41]. *Suryanamaskar* is a component of yoga, which is a mindfulness-based practise. In order to properly practise yoga, one must pay close attention to their breathing, mental activity, and bodily sensations over time [41].

Additionally, practising yoga improves both sustained and focused attention [45]. Similarly, mindfulness is positively correlated with improved academic achievement, life satisfaction, and self-esteem while adversely correlated with sadness, anxiety, exhaustion, substance misuse, and bewilderment[46][47][41].
D) **Surya namaskar effect on GIT**

During this stage of life, *Vatavridhi Vataj* diseases of the gastrointestinal tract, such as indigestion, stomach distention, flatulence, diarrhoea, joint pain, backache, tremors in the limbs, and insomnia are typical issues. Every second elderly person often complains about constipation (*Vibandha*) among these. Therefore, a wonderful option to treating constipation all-naturally is to use numerous Yogic treatments, which are practically free. By hereditary variables, dietary habits, socioeconomic conditions, way of life, occurrence of diseases, etc., it tends to vary in different age groups. Yoga can be used to treat geriatric G.I.T. issues, particularly constipation. According to *Acharya Charaka*, there are two methods: yogic *Ahara* (diet) and yogic *Vihar* (practice). Yogic *Vihara* refers to a variety of yogic asanas and *kriyas*, such as *Surya-namaskar*, *Vajrasana*, *Pashchimothasana*, *Dhanurasana*, Pranayama, Pratyahara, and various *Agnisara Kriyas*, by which one can successfully correct Jatharagni and gain mastery over Apana Vayu[48]. *Surya namaskara* promotes the peristaltic action of the gut, which aids in removing extra gas and relieving constipation[49].

E) **Surya namaskar effect on skin**

The practitioners of Yoga beautiful, clean complexion is a sign of healthy skin since these asanas cause the perspiration to cleanse all the skin pores[50]. *Suryanamaskar* also enhances the function of the intestines' peristalsis, promotes blood flow throughout the body, tones up the kidneys, massages them, and helps the body discharge wastes more effectively through increased sweating. Elimination of toxins is a crucial function for keeping the skin healthy and preventing skin problems[6].

F) **Surya namaskar effect on obesity**

One of the most prevalent metabolic disorders in the modern era is obesity. With the constant change in lifestyle, environment, and dietary practises in the modern period, man has fallen prey to various ailments, including obesity, which is one of them. Obesity is essentially a lifestyle disorder in today's rapidly globalising society, where health is a major concern. The lifespan and life expectancy decline when BMI rises. One of the most prevalent nutritional issues is it. Numerous ailments, including Diabetes Mellitus and hypertension, are caused by obesity[51].

Asanas can benefit the body in different ways depending on whether they are performed individually or in a continuous sequence like the sun salutation. *Suryanamaskar*, however, unquestionably promotes improved calorie burning[52].

A study on the impact of Surya namaskar in the treatment of *Sthaulya* that measured variables including chest, abdominal, and buttock circumferences clearly suggests that *Suryanamaskar* has a significant impact on the treatment of *Sthaulya*. These study's scientific parameters supported this discovery, which indicated correspondingly significant and highly significant improvement[53].

According to a study, Surya namaskar practised regularly for one month caused obese people to lose weight[54]. Surya namaskar is a gentle physical workout that involves breathing. It uses calories moderately and is not overly worn out or exhausted. Since this sort of exercise is isotonic, it raises metabolic rate rather than stress. Different viceroceptors are stimulated by dynamic stretching in both the forward and backward directions as well as rhythmic positive and negative pressure changes in the viscera.
Because of this, all systems function at their best. Adding one or two rounds to routine practice increases the exercise's difficulty. Stamina and cardiovascular endurance are boosted by this. By boosting blood flow, it mobilises the fat that has been deposited or collected. Even if the practitioner is barely perspiring, they feel rejuvenated. It has been observed that even low-intensity activities like *kapalabhati* and 10 minutes of Om recitation can cause the body to undergo psycho-physiological changes[54]. According to a study, obese people who lost almost 4 kg in a month did it in a medically healthy way. These individuals' diets were not under strict monitoring, yet the weight loss effect persisted. This suggests that obese people will need to continue doing Surya namaskar for longer than a month in order to attain their weight loss goals. Regular yoga practice under qualified instruction has a different, more long-lasting impact on obesity than other methods[55]. The *Surya Namaskara* dynamic sequence is crucial for managing obesity[54].

**G) Surya namaskar effect on respiratory system**

Each movement in Surya Namaskar is linked with a deep rhythmic breathing procedure that forces the lungs to vigorously empty and then fill with oxygenated, clean air. All of the lungs' alveoli are stimulated, enlarged, and then cleaned. The blood's oxygen content rises, improving the health and oxygenation of the entire body, notably the heart and brain. Additionally strengthened are the heart muscles. The likelihood of heart attack, blood vessel problems, and overall weariness can all be reduced by increasing microcirculation to the heart. Lethargy and sluggishness are thereby considerably diminished.

The hypothalamic discharges are altered by yoga techniques[56], which decrease sympathetic tone, peripheral resistance, and ultimately diastolic blood pressure. Regular yoga practice increases thoracic compliance, lung and diaphragm excursions, and strengthens the respiratory muscles [57]. Yoga poses also lessen resistance in the airways[58]. All these traits contribute to improve the outcomes of various lung function tests after regular *Suryanamaskar* practice. Yoga practises help strengthen the endurance of the respiratory muscles[59]. According to a 40mm endurance test that also showed statistically significant improvement, people's respiratory endurance appeared to have improved following frequent *Suryanamaskar* practice. Recent studies show that practising yoga raises VO2 max[60][61].

This is brought about by a decrease in resting oxygen consumption and an improvement in oxygen use at the cellular level. Raised VO2 max following frequent *Suryanamaskar* practice can be explained by both improvements in cellular machinery and improved lung functioning. Regular *Suryanamaskar* practice is excellent exercise for both men and women and, according to studies, enhances cardiopulmonary efficiency in healthy teens. These yogic techniques can be suggested to people who want to increase their cardiovascular fitness but are unable to engage in severe exercise[60][61].

Dr. Tim Noakes while writing "The Lore of Running" state that efficiency of the body's circulatory and respiratory systems can be increased by aerobic activities, which enhances aerobic metabolism. Similarly, *Suryanamaskar* exercises performed regularly for 30 to 35 minutes at a medium intensity assist to enhance aerobic metabolism, *Suryanamaskar* exercises increase the efficiency of the pulmonary system or, to put it another way, increase vital capacity.
I) Surya namaskar effect on physical strength

The increased muscle endurance would be a strong justification for doing the exercise programme frequently for people who don’t have much time for strength training or who avoid it altogether. Additionally, since the simulated push-up element of the exercise targets the triceps and serratus anterior muscles especially, regular Suryanamaskar practise may increase muscle strength and stamina. Given that strength declines with age, Suryanamaskar may be especially helpful for old age people.
In contrast to Telles et al. [66] who discovered a decrease in resting heart rate following the implementation of a yoga training programme and instruction on how to specifically lower resting heart rate, few study did not detect any differences in resting heart rate following the yoga intervention. Significant drops in heart rate from baseline readings were also discovered by [67], who examined the effects of a six-week yoga intervention on participants with coronary artery disease. This finding of the study Telles et al.'s [66] as it stimulated the protocol for voluntarily lowering heart rate since multiple journal comments on the difficulty of lying still for 5 minutes, it might be deduced that the mindset of true relaxation following the rigours of the Suryanamaskar routine was difficult.

J) Surya namaskar effect on Diabetes

Yoga activities are said to lessen life stress and even lower postprandial blood glucose levels [37],[68] It has been demonstrated that Surya Namaskar increases the dynamic flexibility of the chest wall [69]. The second and third poses involve backwards and forward bending, targeting the hip flexors, anterior trunk, hamstrings, and upper back for flexibility; the fourth and sixth poses target the gastrocnemius for flexibility. The cobra stance, which is excellent for this purpose, is included in the final elements [8][70]. Surya Namaskar, which is a self-controlled spinal adjustment, can result in better spinal adjustments in cases of low back pain [71]. In the case of asymptomatic persons, the Surya Namaskar's 12 exercises, which cover both extension and flexion postures for the spine, might be employed as a promotive exercise intervention [72].

Surya Namaskar improves the body's ability to digest glucose, and the endocrinal surge typically results in improved circulation and sustained high levels of energy [73]. A randomised controlled experiment has demonstrated the value of yoga as a diabetic intervention [73][74]. Additionally, it reduced the cardiometabolic risk [75].

3. Conclusion, Limitation and future perspective

The results show that Surya namaskar improves body flexibility, lowers blood sugar levels, stress, flatulence, body weight constipation, and high blood pressure, increases physical strength, promotes healthy skin and respiratory muscles, treats premenstrual symptoms, lowers the likelihood of high-risk pregnancy, lowers seminal oxidative stress and oxidative DNA damage, and improves sperm motility in men. We consequently come to the conclusion that Surya Namaskar should be performed daily by everyone to reap these advantages. Because the full benefits of yoga have not yet been fully understood, more can yet be learned about the advantages of Suryanamaskar. Suryanamaskar can be advised in future disease management strategies to enjoy its beneficial effects after more research to understand its influence at the molecular level. Future studies with a solid research design, a sizable sample size, and sophisticated methods should, nevertheless, validate the findings of the current study.

4. Acknowledgment

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5. Conflict of interest

Authors declare no conflicts of interest.
6. Reference


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