

PART I

**“THE CONCEPT AND PRACTICE OF SŪRYANAMASKĀRA
ACCORDING TO VARIOUS ANCIENT TEXTS”**

PART II

**“EFFECT OF SŪRYANAMASKĀRA ON SUSTAINED
ATTENTION
IN SCHOOL CHILDREN”**

Dissertation submitted by

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Under the guidance of

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Submitted to

SWAMI VIVEKANANDA YOGA ANUSANDHANA

SAMSTHANA (SVYASA)

(Declared as a Deemed to be University under the section 3 of the UGC act, 1956)

CERTIFICATE

This is to certify that Parag Javadekar is submitting this literary research entitled “**THE CONCEPT AND PRACTICE OF SŪRYANAMASKĀRA ACCORDING TO VARIOUS ANCIENT TEXT.**” And Experimental research entitled “**EFFECT OF SŪRYANAMASKĀRA ON SUSTAINED ATTENTION IN SCHOOL CHILDREN**” in partial fulfillment of the requirement for the Master of Science (Yoga & Education) registered with effect from January 1, 2010 by the Swami Vivekananda Yoga Anusandhan Samsthan under the division life sciences and is a record of the work carried out by him in the institute.

(Guide)

Dr. Manjunath N.K.

Date:

Place:

DECLARATION

I, hereby declare that this study was conducted by me at Swāmi Vivekānanda Yoga Anusandhāna Samsthāna (SVYASA), Bangalore, under the guidance of Dr. Manjunath N.K., Swāmi Vivekānanda Yoga University, Bangalore.

I also declare that the subject matter of my dissertation entitled below has not previously formed the basis of the award of any degree, diploma, associate ship, fellowship, or similar titles.

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Parag Javadekar

Date:

(Candidate)

A C K N O W L E D G E M E N T

To all of my teachers who have sparked my curiosity and imagination, and have nurtured and guided me throughout all the twists and turns of my journey.

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I am indebted to my family and parents for their love and support.

Finally I thank that unseen Divine (Lord Ganeśa) without whose wish, this work wouldn't have been possible.

Bangalore.

Date:

**STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO TRANSLITERATE
SANSKRIT WORDS**

अ आ इ ई उ ऊ ऋ ॠ

a ā I ī u ū ṛ ṝ

ऌ ॡ ए ऐ ओ औ अं अः

Lṛ ṝ e ai o au am aḥ

क ख ग घ ङ

ka kha ga gha ṅa

च छ ज झ ञ

ca cha ja jha ṅa

ट ठ ड ढ ण

ṭa ṭha ḍa ḍha ṇa

त थ द ध न

ta tha da dha na

प फ ब भ म

pa pha ba bha ma

य र ल व श ष स ह

ya ra la va śa ṣa sa ha

ळ क्ष ज्ञ ॐ

ḷa kṣa jña om

PART I

LITERARY RESEARCH

**“CONCEPT AND PRACTICE OF SŪRYA NAMASKĀRA ACCORDING
TO VARIOUS ANCIENT TEXTS”**

ABSTRACT

Sūrya Namaskāra known in English as **Sun Salutation** is a common sequence of *Haṭṭhayoga āsanās*. Its origin can be traced back to pre-Vedic period. Traditionally this practice has been associated with the worship of Surya, the solar deity. The sequence of movements and poses can be practiced on varying levels of awareness, ranging from that of physical exercise in various styles, to a complete *sāadhanā* which incorporates *asana*, *prāṇāyāma*, *mantra* and *chakra* meditation.

The physical base of the practice links together twelve *āsanās* in a dynamically performed series. These *āsanās* are ordered so that they alternately stretch the spine backwards and forwards. When performed in the usual way, each *asana* is moved into with alternate inhalation and exhalation (except for the sixth *asana* where the breath is held in external suspension). A full round of *Sūrya Namaskāra* is considered to be two sets of the twelve poses with a change in the second set to moving the opposite leg first through the series.

There are numerous references to praising the Sun to enhance good health and prosperity, in the Vedas. Some of these Vedic hymns were incorporated into Nitya Vidhi (Daily mandatory routine for a Hindu). These daily procedures were termed *Sūrya Namaskāra* (literally translates as "sun salutations"). The forms of *Sūrya Namaskāra* practiced vary from region to region. Two such popular practices are *Tṛucha Kalpa Namaskāra* and *Āditya Praśūa*.

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CHAPTER 1

INTRODUCTION

Many ancient civilizations developed religions based on sun worship. In India this worship was of Surya, the Lord of the heavens, the deity associated with the physical manifestation of the solar orb, the sun. The sun was recognized early on as the giver and sustainer of life. This worship evolved into not just an honoring of the sun as the sustainer of the physical life force but also the illuminator of the spiritual path. In the words of Paracelsus, the medieval alchemist, "There is an earthly, material sun, which is the cause of heat; and all who are capable of seeing it, even those who are blind, can feel the heat. And then there is an eternal sun, which is the source of wisdom; and those who are spiritually awakened will see this sun and be conscious of His existence."

The sun gives us many metaphors for life; at each dawn it becomes Brahma, the creator of life, at midday it grows into Vishnu the sustainer, and at night we move into the time of Shiva, the destroyer. Every day we are reminded that for rebirth to take place a death must first happen. This is something we also experience with each season. Summer would be the time of sustaining, winter of death, and both fall and spring are the times of creation moving us into the next phase of life. The winter solstice was thought, by many cultures, to represent the death of the sun. Three days later, on December 25, when the sun could be seen to be growing in intensity the rebirth of the sun was celebrated. This date is still celebrated in many religions worldwide.⁽¹⁾

Indian festivals are wondrous and joyous series of events. These moments are defined by the changing luminosity of the sun. Rathasaptamī is symbolic of the change of season to spring and the start of the harvesting season. For most Indian farmers, it is an auspicious beginning of the New Year. "Ratha" means chariot and "saptamī" means the 7th day, it is the day when the Surya/Sun god is believed to ride on the chariot drawn by 7 horses to gift the beautiful season "spring" to India. It is during this time that Surya/Sun moves from the southeast to the northeast. This festival falls on the 7th day of the Hindu month *māgha*, February in the Gregorian calendar. The days become warmer and bring relief and cheer to life after the bitter winter months.⁽²⁾

SIGNIFICANCE OF SŪRYA NAMASKĀRA

1.1.1 Spiritual significance of the worship of the Sun:

Sun is the centre of the universe and is considered to be the source of life on planet Earth. Without the Sun, one cannot imagine of existence at all. Hence from time immemorial, the Sun has been revered as a deity and worshipped. *Sūrya* Namaskāra is a salutation to this powerful celestial body, around which other planets revolve and take light and heat from it. It is believed that whoever worships Lord Surya is bound to have a dynamic personality, as He rejuvenates life and makes one feel young, agile, brilliant and healthy.

In addition, in Hindu philosophy, *Sūryaupāsana* (meditation) is prescribed in the scriptures, as Lord Krishna Himself had given the scriptural teachings to Lord Sun. This has reference in the *Bhagavad gīta* (Chapter IV). Therefore one needs the blessings of Lord Surya to gain a subtle intellect, to understand the ultimate truth of the Lord.

ईमम् इवस्वते योगं प्रोक्तवान्-अहम्-अव्ययम् ॥

विवस्वान्मनवे प्राहमनुरिक्ष्वाकवेऽब्रवीत् ॥ १॥

īmam ivasvate yogam proktavān-aham-avyayama

ivasvān manave prāha manur-ikṣvākave (a) bravit

***Bhagavad gīta*(4.1)**

Further, *Upāsana* means invoking the superior on inferior objects. In this context, we need to invoke Lord Surya in the solar disc, which is the media in which he resides. According to the scriptures, all spiritual seekers travel to higher worlds through the process called *śukla gaṭi*.

Another reason why Hindus worship Lord Sun is that it is believed that the prayer *āditya hridayama*(which is in praise of Lord Sun) was given by Agastya Rishi to Lord Rāma at the

time of war, to gain victory over rāvaṇa. By chanting this prayer, Rama was easily able to kill his opponent in the battle-field. In addition, the Sun and the Moon are visualized as the two eyes of the Universal form of the Lord and therefore they are revered.

Besides, in the Vedas, Lord Surya finds a mention in most of the portions, as he helps the spiritual seekers to attain the ultimate truth as He himself imparts the highest knowledge.

Also, Hindus chant the gāyatri mantra, in which people invoke Lord Surya to gain physical, mental, intellectual and spiritual health.

Therefore, there is a strong spiritual footing as to why Lord Surya has to be worshipped and Sūrya Namaskāra is one of the best ways to gain His blessings to lead a healthy and spiritual life on this earth.⁽³⁾

1.1.2 Scientific significance for the worship of the Sun:

Firstly, it is a known fact that the Sun sustains life on Earth. It is scientifically proved that plants and organisms, with no exception to human beings need the Sun for their survival. In fact, the ecological balance is maintained because of the Sun.

Secondly, the hydrological cycle continues in all seasons, without which we wouldn't get rains. And if the rains fail we would not get any grains, vegetables and fruits that are essential for our growth and health. The hydrological cycle continues throughout the day, just as our breath and the credit go to the Sun. So we need to consider the Sun as a visual God, who enables this basic survival on Earth. With this attitude, we worship Him for the benefit of the whole humanity.

Thirdly, the seasons of the year come in punctually at the right time, because of the Sun. They bring monsoons, which are very much needed for the nourishment of the Earth and for the water-bodies to replenish with water. People around the globe experience the different seasons and get to see the seasonal birds, fruits, vegetables and the changing flora, because of

the Sun. Why then should we not revere this celestial body as a God and offer our salutations to Him?⁽¹⁾

1.1 SUN ACCORDING TO VARIOUS SCRIPTURES

According to RIG-VEDA

अयं देवानामपसामपस्तमो यो जजान रोदसी विश्वशम्भुवा ।

वि यो ममे रजसी सुक्रतूययाजरेभिः स्कम्भनेभिः समानृचे ॥ १।१६०।४ ॥

ayam devānāmapasāmapastamo yo jajāna rodasī viśvaśambhuvā ।

vi yo mame rajasī sukratūyayājarebhiḥ skambhanebhiḥ samānṛce ।। 1।160।4।।

“He the most active of the active Gods, who produced the heaven and earth which are beneficial to all; who from a desire to benefit (Men) measured (constructed) the words, with their un-decaying supports, he has been lauded (by us)”.

Sun is described as:

The remover all weakness,
Healer of all illness,
Lord of all that stands and goes,
He slays the demons
And guards the worshippers.

Finally they state,

ओम् भूर्भुवः स्वः तत्सवितुर्वरेण्यं

भर्गो देवस्य धीमहि धियो योनःप्रचोदयात् ॥

om bhūrbhuvāḥ svaḥ tatsaviturvareṇyam bhargo devasya dhīmahi dhīyo yo na pracodayāta | |

We meditate in adorable glory of the radiant sun.

May he inspire our intelligence? (*Rig-Veda – 3, 62, 10*)

According to Rig-Veda VII 90, 11, 12

“Verify sūrya thou art great, verify, āditya, thou art great. The majesty of three who art great is celebrated; certainly God, thou art great, 12. Verify, sūrya, thou art renowned; o God, thou art very great; through thy greatness thou art the divine leader of the Gods the pervading, irresistible luminary”.⁽⁴⁾

According to YAJURVEDA.

The glory and importance of the God sun is described in YAJURVEDA –

Sūryanamaskār mantra of Taittirīya Aranyakain first Prapātaka is as follows

सूर्यो मरीचिमदत्ते सर्वस्माद्भुवनादधि ।

तस्याः पाकविशेषेण ।

स्मृतंकालविशेषणम् ॥

द्वितिऽनुवाकः । २ । (आरुणप्रश्न)

sūryo marīcimadatte sarvasmādbhuvanādadhī ।

tasyāḥ pākaviśeṣeṇa ।

smrutāṅkālavīśeṣaṇam । ।

dvitīyoanuvākaḥ । 2 । (ārunapraśna)

First the sun spreads his beam over the world. By the ripening and quickening rays of the sun, several changes take place. First the seed which is sown, imbued by the rays of the sun sprouts. Then the sprouts grow, then the bud bursts, then it turn into leaves, then blossoms, and finally it gives fruits. In this way there are different stages. All these stages occur due to variations caused by the march of time. These variations of time are caused by the sun.

ॐ । आसत्येन रजसा वर्तमानो निवेशयन्नमृतं मर्त्यं च ।

हिरण्ययेन सविता रथेनादेवो याति भुवना विपश्यन् ॥

om । āsatyena rajasā vartamāno niveśayannamṛtaṅ martyaṅ ca ।

hiraṇyayena savitā rathenādevo yāti bhuvanā vipaśyan । ।

[RV (1.35.2), KYV (3.4.11.2) SYV (33.43); (34.31)]

Moving along the worlds of Truth duly establishing the immortal and the mortal, God *Savitra* comes in his golden car beholding the worlds

चित्रं देवानामुदगादनीकम् ।

चक्षुर्मित्रस्य वरुणस्याग्नेः ।

आप्राद्यावापृथिवी अन्तरिक्षम् ।

सूर्य आत्मा जगतस्तथुषश्चेति ॥ स्तमोऽनुवाकः ॥६॥

citrani devānāmudagādānikam |

cakṣhūrmitrasya varuṇasyāgneḥ |

āprādyāvāpṛthivī antarikṣhām |

sūrya ātmā jagatastathuṣaśceti | | sptamo nuvākaḥ | | 6 | |

The disc or the globe of the Sun rises in the east. It is variegated. It is bright and removes the darkness. It helps the eye to see all things. So it is considered as an eye of all Devas. It is considered as an ever shining Deva and it is all-pervading. The deity of such disc is innate in all movable and immovable things.

तत्सवितुर्वरेण्यम् । भर्गो देवस्य धीमहि ।

धियो यो नः प्रचोदयत् ॥ एकदशोऽनुवाकः ॥२॥

tatsaviturvareṇyam | bhargo devasya dhīmahi |

dhiyo yo naḥ pracodayat | | ekadaśo nuvāka ḥ | | 2 | |

We concentrate on the supreme splendor of the sun that stimulates all kinds of energy to proceed on the rightful path of self-realization.

tatsaviturvaḍīmahe | vayni devasya bhojanam |

ṣhḍeṣhṭhānsarvadhātāmam | turani bhagasya dhīmahi

| | ekādśo nuvāk 3 | |

We request the lustrous sun to give us nourishment and enjoyment and to help us to concentrate on the great nourisher of the entire world. (Sastrigal 1966)

SĀMA VEDA

In the sāma veda 3.9.7 it is described that the solar rays have power of healing of all the diseases.

“The solar rays drive away diseases

Dispel malignant thoughts

And keep us away from sins”

The divine is source of energy to the Universes.

ATHARVA VEDA

In the atharva veda 17. 1. 30 it is rightly said that the rising Sun, liberates the human beings from the bondage of birth and death.

“May the raising Sun liberate us from the bondage of birth and death”.

ACCORDING TO ISĀVĀSYA UPANIṢADA

ओम् हिरण्मयेन पात्रेण ।

सत्यस्यापिहितम् मुखम् ।

तत्त्वम् पूशन्नऽपावृणु सत्यधर्माय दृष्टये । ।

*hiraṇmayena pātreṇa satasyāpīhitāni mukham |
tatvāni pūṣanna apāvṛṇu satyadharmāya dōṣṭāye | | īṣa upa 1 | |*

Like a lid to a vessel, Oh sun, your golden orb covers the entrance to the truth.

Kindly open the entrance, to lead me to the truth. ⁽⁵⁾

ACCORDING TO TAITTIRIYA UPANIṢAD

“He who is here in the human being, and he, who is there in the sun, are one and the same.”

(sa yas-cayam puruṣe, yas-chasavadītye, sa ekah). Nourishing all beings, He is Pushan, the nourisher, possessed of sparkling rays, he shines like gold. Being evereffulgent and golden by nature, it is always day time for him. He is far away from the darkness of ignorance. ⁽⁵⁾

Other texts

RĀMĀYAṆA

In ancient India great avatar Rama became the king of the solar race in the epic Rāmāyaṇa. The roots of the present Hindu culture lie in the ancient Vedic scriptures, which contains numerous slokas referring to the sun.⁽⁶⁾

एतच्च छुत्त वामहातेजानष्ट शोकोऽदा।

धारयामाससुप्रतीतोराघवःप्रयतात् म्वा॥२८॥

Hearing this advice, Sri Rama, who was endowed with extraordinary energy and had a subdued of mind, found his grief immediately dissipated. Nay feeling greatly delighted, He retained the alleluia in his memory. (Aditya Hrudyam: 28)

CHAPTER 2

ORIGIN OF SŪRYA NAMASKĀRA

According to the Oxford English Dictionary, the definition of "origin" is "the point where something begins or arises".

2.1 VEDIC ORIGIN:

There are numerous references of praising the sun for the purpose of good health and prosperity. In vedas. Some of these Vedic hymns were incorporated into Nitya Vidhi (Daily mandatory routine for a Hindu) for the well being of an individual, through salutations to the Sun. The forms of Suryuanamaskar practiced vary from region to region. Two such popular are *Tṛucha Kalp Sūrya Namaskārah* and *Āditya Praśna*.

a) *Tṛucha Kalpa Namaskāra*:

Each Mantra in Veda is called a "tṛucha". Group of three rucha is called as Trucha. "*Tṛucha Kalp Sūrya Namaskārah*" is one method of performing *Sūrya Namaskāra*.

i) **Sankalp:**

You make a resolution in the beginning, that you are doin this act of performing 'surya namaskar' by praying to the sun, requesting him to give you good health and strength to work hard.

ii) *Dhyāna mantra*:

The *dhyāna mantras* recited/chanted.

Verse:

dhehīh sadā savitrmanamalamadhyavartī

nārāyanah sarasijāsanasannivistah |

keyūravān makarakumalavān kirtī

hārīnmayavapurdhṛtaśamkhacakrah | |

Meaning:

“Always worship ‘The Sun’ (our energy source) sitting at the centre of his galaxy on Lotus, wearing Keyoor, Makarkundal crown and holding conch, chakra and having glittering golden body.”

b) *Sūrya Namaskāra Mantra*

After dhyana mantra, *Sūrya Namaskāra* are performed by chanting mantras. Mantras are arranged in a specific way by y. They consist of the three ruchas taken from 1st Mandala, 9th anuvak 50th Sookta in Rig Veda, which are composed in ‘Anushtup Chandas’. Kanva Sage (Rushi) has composed them. According to him by reciting/chanting these three ruchas and performing *Sūrya Namaskāra*. The Sun is pleased with you and cures many of your diseases leprosy, leukemia heart trouble, etc. Meaning of the three ruchas: “O, radiant Sun rising in the sky, please destroy the disease in my heart as well as diseases of my external body. Let inner and outer diseases of my body be destroyed by brilliantly shining Sun-the son of Aditi.” Nama mantra of the *Sūrya Namaskāra* have three sections:

1. *Praṇavākṣara* (Aum)
2. *Bījākṣara*
3. Name of ‘The Sun’.

2.2 PAURĀṆIKA ORIGINS

Āditya hridayamais another ancient practice which involves *Sūrya Namaskāra*. It is a procedure of saluting the sun, taught to Sri *Rāma* by sage *Agastya*, before his fight with *Rāvaṇa*. It is described in the “Yuddha Khanda” Canto 107 of Ramayana. There are in total 124 names praising the sun in the whole procedure. The names in verses 10 – 13 are given below:

*“āditya savita surya khaga puṣṇa úabhastimana
suvarnasadr̥ṣa bhānu hiranyaretasa dīvākara haridasva
ṣahasrarcīśa saptasapti maricimāna timironmathana śambhu
tvaśta mārtaṇḍa anśumana hiraṇyagarbha śīśira tapana
bhāskara ravi agnigarbha āditiputra sankha śisiranasana | ”*

As can be noted by the names in bold, most of the names used in the present in these four verses. In 15 – 20 verses, salutations to sun are described. An example from the 15th verse is:

“the resplendent among the splendid. Oh! God, appearing in twelve forms (in the shape of twelve months of the year) salutations to you”

2.2.1 Sandhyāvandana

The Veda samhitas have been the foundation for all aspects of Hindu or Indian culture since ancient days. These books are vast-Rigveda Samhita alone has about ten thousand verses. Thus, persons who read them entirely everyday are necessarily small in number. Thus even, from ancient days, at least three thousand year ago, a small subset of the veda mantras were chosen by our savants so that they could be recited at least once a day by all persons. Later on all these mantras and the associated ritual came to be labelled as *sandhyā*worship. Sandhi means a junction, typically the conjunction of night and day. Thus, the recitation should be done thrice daily in the morning dawn before sun rise, at noon and in the evening twilight. Sunrise and Sun set are caused by rotation of earth on its own axis. At every instant of time there will be sunrise at one place and Sunset at another place. At sunrise, rays of sun will hit that part of the earth for the first time that day., resulting in the release of energies. Similarly at sunset there will be withdrawal of energies. Sunrise constitutes a change from ‘darkness’ to ‘light’ and hence constitutes a *sandhyā* i.e.junction. Similarly sunset is also a *sandhyā* i.e.junction.

The core part of the worship is the repetition or japa and meditation the light of the supernal Sun, Savitra or on the Goddess Savitri using the famous mantra popularly known as *Gāyatri* occurring

originally in Rigveda Samhita, third mandala, sukta 62 and verse 10, i.e., RV (3.62.10) revealed to the sage *Viśvāmitra*.

2.2.2 Various steps of *Sandhyāvandana*:

After taking the bath and wearing the traditional religious dress one should apply the religious marks (like the vibuti or the urdhvapundra) as per one's family traditions, on the forehead, and sit on the seat (kept aside and to be used only for such religious purposes). Though there are difference in the procedure and the various steps to be followed, as per differing traditions, the six steps common to all will be elders in the family.

These six steps are

Ācamana, Prāṇāyāma, Mārjana, Ārghyapradāna, Gāyatri japa and Sūryopastāna.

a) *Ācamana*

Ācamana is the ceremonial sipping of water from the right hand cupped in the shape of cow, to the chanting of appropriate mantras like *keśavāy svāhā* and touching specified parts of the body for ritual purification. This *Ācamana* is a general purificatory act that preceds every religious undertaking.

b) *Prāṇāyāma*

Prāṇāyāma is control of the pranic energy through the regulation of the breathing process as detailed in works on yoga. *pūraka (inhalation), kumbhaka (retention) and recheka (exhalation)* are its three steps. The *gāyatri mantra* along with the *vyāhṛtis* is used in *Prāṇāyāma* to keep time. *Prāṇāyāma* helps in the control of the mind also.

c) *Mārjana*

Literally, '*mārjana*' means cleaning or purifying. It consists of sprinkling of water on specified part of the body with mantra '*āpo hiṣṭhā*'.... This process will make the body ceremonially pure and fit for the ritualistic act.

d) *Ārghyapradāna*

Any object fit for being offered in ritualistic worship sense, it is the offering of water taken in the two hands cupped together, by repeating the *gāyatri mantra* and addressing the sun-god (i.e. savitra or God the creator, in the orb of the sun). This is just to show our gratitude to sun-god who is our primary life support.

e) *Gāyatri japa*

This is the most important part of the *sandhyā* ritual, its primary steps are *karṇayāsa aṅgayāsadhyanā* and *japa*.

'*Nyāsa*' means 'to keep or to place'. It is aimed at filling the fingers of the hand and other limbs like a head and heart with the divine power of the deities.

Dhyāna is meditation on the deity as per the detailed description given in the hymn (called *dhyānśloka*) while repeating it. The goddess *Gāyatri* within the orb of the sun is the deity here.

After *dhyāna* comes *japa* or repetition of the *Gāyatri mantra*. While doing *japa*, *dhyāna* on the form of the goddess should be continued. It is better to repeat the mantra 1008 times or at least 108 times per sitting.

f) Sūryopasthāna

Repeating the prayer addressed to deity *gāyatri* (in the orb of the sun) in the standing posture, the sun, is '*sūryopasthāna*' (*upasthāna*=standing). This is the last rite bidding farewell to the goddess after having invoked her and satisfied her through *japa*.

In this way in old days ancient sages worship the God sun.

CHAPTER 3

SUN MANTRAS

The mantras are especially composed chants, to bring about different patterns of resonant. They are part of a broad science called *Tantra śāstra*. *Mantrās* formed the vital tool in concentrating the desires of everyone in tune with Dharma; to establish health, harmony and happiness at the individual, family and social levels have always been the goal of *Mantra śāstra*. Every mantra has its own resonance pattern. To produce resonance while chanting the mantra loudly is the physical aspect of chant.

Every mantra has two dimensions the exoteric and the esoteric. The exoteric is the external, gross aspects as massaging, relaxing or stimulating, exciting effects in the physical body; strengthening of the vocal cord muscles; voice culture, and many more. The esoteric dimension refers to the changes in *Prāṇa* and mind, intellect (by bring the meaning) and emotions.

When the mantra is chanted with resonance, the esoteric dimension emerges, *Prāṇic* flows start. Mental waves build up a pattern.

3.1 *Praṇava & Bīja Mantra, Bījākṣara*

Praṇava:

Om is pronounced as a long or over-long nasalized close-mid back rounded vowel, [ō::]), though there are other enunciations adhered to in received traditions. It is placed at the beginning of most Hindu texts as a sacred incantation to be intoned at the beginning and end of a reading of the Vedas or prior to any prayer or mantra. The *Māndukya* Upanishad is entirely devoted to the explanation of the syllable. The syllable consists of three phonemes, *a Vaiśvānara*, *u Hiranyagarbha* and *m Īśvara*, which symbolize the beginning, duration, and dissolution of the universe and the associated

gods *Brahma*, *Viṣṇu*, and *Śiva*, respectively. The name *omkāra* is taken as a name of God in the Hindu revivalist *Ārya samāja*.

Praṇava (AUM), *Bija Mantra*, *Sūrya Mantra* and the *Sūrya namaskāra* are all complementary to each other. Each one enhances and ensures the positive results of the other. *Bījākṣara* is the root of *Prāṇāyāma*. Some exercises in *Prāṇāyāma* are considered the part of *sūrya namaskāra* to treat certain diseases.

Praṇava / AUM are pronounced before the *Bija Mantra*. It is pronounced in three segments. The articulation of these parts is long longer longest, in the ascending order. (AaaaaUuuuuuuuuMmmmmmmmmmm...) Lips closed at the last segment. The three segments of AUM activate stomach, heart and brain respectively. The articulation of AUM creates vibrations at the *Manipur Chakra*, the *Anāhat Chakra* and the *Ādnya Chakra*. Digestion, respiratory & sensory activities go through the powerful lens of AUM turning intellect and memory into sharp, powerful, pointed weapons.

Bija Mantra:

The *Bija Mantras* are six in numbers. The cycle of the six *Bija Mantras* is repeated, of course, in sequence to cover the twelve names of the Sun God. The *Bija Mantras* are as follows:

Aum - hrāṇi hrīṇi hrūṇi hrāiṇi hrōṇi hraḷ

The *Bija Mantra* can also be written as follows:

हां हिं हुं है हो हः ।

They all act as stimulus to the different organs of the body they are as follows:

hrāṇi – Acts as a stimulus to the brain, heart, respiratory organs, etc

hrīṇi – invigorates the throat, palate, heart, digestive and respiratory organs.

hrūṇi – strengthens the liver, spleen, stomach, abdomen, intestine, etc.

hrāiṇi – stimulates kidneys

hrōṇi – normalise the function of the rectum and anus

hrah – develops the throat and chest.

*Bīja Mantra*s pronounced together with the name of the Sun God. The position of the *Bīja*

*Mantra*s between the sound Aum and the name of the Sun God. For example:

AumHrāmMitrāyaNamah:|

Bījākṣara:

The root alphabets of the *Bija* Mantra and the sequence of their pronunciation are as follows:

1) *h* = It represents *Akash*. It is *Suryabij*, *SuryaTej* in miniature. It is also called *Mahapran*. Heart is the source of its pronunciation. It empowers the heart to perform all its functions in a better manner.

2) *r* = It represents the element Fire hence it is called *Agni-Bij*. The centre of the forehead is the source of its pronunciation. The palate and the brain are gently buffeted by the vibration. The result is good taste and better intellect. The balanced use of tongue, both for eating and speaking, is on progressive mode.

3) *Swar*(Vowel) is a sound pronounced with minimum friction in the vocal cord. Sound vibrations have their effect on the body. Generally, ears reject the loud, heavy, round sound of drums and trumpets. This sound has adverse effect on stomach. Minimal sound vibrations create maximum effect on certain parts of the body. When long Eeee...is uttered the minute vibrations work upon the palate, the vocal cord and the nasal area making the passage clear of mucus, soft and strong.

- When long Uuuu...is uttered, the minute vibrations work upon the stomach, small intestine, pancreas making the digestive system strong.
- When the combined vowel is uttered, as in *Hraim*, the minute vibrations work upon kidney and urinary passage making the organs strong and sensitive.
- When the combined vowel, as in *Hroum*, is uttered the minute vibrations work upon excretory system making the organs strong and sensitive.

4) *Anunasik*: *Anunasik* is a sound vibrations created in the nasal area. These vibrations keep the nasal passage clean soft and wet.

5) *Visarga*. (:) The sound vibrations created by *Visarga* work on the chest and the vocal cord

Combination of *Praṇava – Bīja Maṇṭra– Sūrya Mantra*:

The FIRST SERIES of twelve *Sūrya Namaskāra*s performed with the pronunciation of each name of the Sun God / Surya Mantra in sequence before the start of every *Asana* of the *Sūrya Namaskāra*. (The bunch of twelve Surya Mantra and twelve *āsana*s ONE *Sūrya Namaskāra*)

The SECOND SERIES of twelve *Sūrya Namaskāra*s performed inserting a *Bija Mantra* in between the AUM and the Surya Mantra, before each *Sūrya Namaskāra*.

āum hraini mitrāya ṇamah |

āum hrini ḍavaye ṇamah |

āum hruiṇi ṣuryāya ṇamah

āum hraini bhanave ṇamah | |

āum hruiṇi khagyāa ṇamah |

āum hraḥi puśne ṇamah |

āum hraini ḥiranyagarbhyaa ṇamah |

āum hrini maricaye ṇamah |

āum hruiṇi ādityāya ṇamah |

āum hraini ṣavitre ṇamah |

āum hruiṇi arkyāa ṇamah |

āum hraḥi bhāskarāya ṇamah |

CHAPTER 4

SŪRYA NAMASKĀRA

Sūrya Namaskāra is a well-known technique within the yogic practices. Its versatility and application make it one of the most useful methods to induce a healthy, vigorous and active life. And at the same time prepare for spiritual awakening and the resultant expansion of awareness.

Sūrya Namaskāra, meaning “salutation to the sun”, can be seen as a form of worship of the sun, amend all that it represents on the micro and macrocosmic levels. In yogic terms this indicates that the practice of *Sūrya Namaskāra* awakens the solar aspects of man’s nature and releases this virtual energy for the development of higher awareness. This can be realized by the practice of *Sūrya Namaskāra* each morning as well as being fine way to pay tribute to the source of creation and life.

Sūrya is sun. *Namaskāra* is to name, to greet. *Sūrya Namaskāra* is Sun Salute. This *vinjāsa* is traditionally practiced in the morning before sunrise. It is invigorating and good for digestion. If the postures are done between jumping’s “*the fast movements and quick change in position ensure freedom of movement, creating agility and flexibility and improving blood circulation. The dull brain becomes active and the brooding mind gets refreshed*”⁽⁷⁾

Sūrya Namaskāra:

There are twelve positions in *Sūrya Namaskāra*. Twenty-five such *Namaskāras* form one *āvṛttī*(frequency). *Sūrya Namaskāra* must be performed preferably in an open and airy place. Perform *Sūrya Namaskāra* slowly without exerting too much or panting and puffing. There is one Mantra for each of the twelve *Namaskāras*- there by you also recites the 12 names of Sun.

Dakśāsana



Procedure: In the first position of *Sūrya Namaskāra* contemplate the virtues of Lord Surya with concentrated mind and feel that you are the friend of everybody and have friendship with every creature on the earth. Immersing yourself with these feelings stand erect stretching your hands, neck and all other parts of your body. Stretching both of your arms, touch your thighs with palms and inflate the chest and point your vision on the tip of the nose. This is a position of attention.

Benefits: Disorders of the skin and waists are corrected; the back and the legs become strong. Focusing of the vision on nose helps to control the mind. It is an easy and effective way of attaining good health and development of personality for the students. Meditating with concentrated mind enhances confidence.

1st Position: *Praṇāmāsana* (Prayer pose)



Mantra: *āum hrīṃ mītrāya ṇamah |*

Concentration: Heart centre (*Anāhata*).

Procedure: Stand erect with your chest out, feet together, knees pulled up and thighs tight like in *Tāḍāsana*. Bring your hands forward, in front of your chest as if in prayer, elbows straight and not drooping.

Benefits: Good for the diseases of the throat and voice is enhanced. Both mind and body become healthy.

2nd Position: *Hasta utthānāsana* (Raised arms pose)



Mantra: *āum hrīṃ ravaye ṇamah |*

Concentration: Neck centre (*Viśuddhī*)

Procedure: On inhale, stretch your arms up over your head, palms still together. Then arching back as far as you can go, stretch with your arms apart for next pose.

Benefits: Both the shoulders and the food pipe (Esophagus) get exercise and diseases related to them are corrected. Eyesight is also improved.

3rd Position: *Pādahastāsana* (Hand to foot pose)



Mantra: *āum hrūm śuryāya namaḥ* |

Concentration: Root of spinal column (*Svādhiṣṭhāna*).

Procedure: While exhaling, swing down from the hips keeping your upper body and torso straight. Without bending the knees place your hands on either sides of your feet flat on the mat, head as close to your knees as possible.

Benefits: Disorders of the belly and digestive system are corrected. The chest and hands become stronger and you become well balanced, beautiful and good looking. Diseases of the feet and fingers are also corrected.

4th Position: *Aśva Sancālanāsan* (Equestrian pose)



Mantra: *āum hrīmī bhanave namaḥ* |

Concentration: Eyebrow Centre (*Ajñā*).

Procedure: Inhale, bring the right foot to the back of the mat on the toes like a lunge. Using your finger tips for support and the left leg at a right angle start bending the extended leg at the knee towards the floor and look up.

Benefits: The posture stretches the small intestine and the seminal vesicles. Hence this posture helps in correcting the constipation and diseases of the liver. Thinness of the semen is also corrected. Diseases of the throat are also corrected.

5thPosition: *Dandāsana* (Plank pose)

Mantra: *āum hrouri khagyāa namah* |

Concentration: Neck Centre (*Vishuddhi*).

Procedure: Retain your breath and extend your left leg back on your toes side by side, your right without moving the position of your hands and leg at all. Palms flat on the mat, keep your spine straight and elbows locked. Do not let your head or hips drop. It should look like you are about to do a push up.

Benefits: One gets relief from the pains – especially of arms, legs and the knees. Bulging waist is trimmed and it is good for the abdominal disorders.

6thPosition: *Aśtanāga Namaskār* (Salute with eight parts or points)



Mantra: *āum hraḥ puśne namah* |

Concentration: Behind Navel (*Maṇipura*).

Procedure: Exhale, bending your elbows towards your body and going down as low as you can at the shoulders while keeping the rest of your body perfectly stiff exactly like a push up. Once down near the floor, bend and drop your knees, chest and forehead to the ground lightly touching in that order.

Your hips and pelvic should still be raised. Eight points should be touching the floor in this step- forehead, chest, and two palms, both knees and both feet.

Benefits: This posture makes the arms strong. If ladies perform this Asana before getting pregnant, the breast fed babies could be saved from the attacks of many diseases.

7th Position: *Bhūjangāsana* (Cobra pose)



Mantra: *āum hrani hīranyagarbhyaḥ namah |*

Concentration: Root of spinal column (*Svādhiṣṭhāna*).

Procedure: Inhale, while swinging your body forwards, straightening your arms, stretching your shoulders upwards and lowering your hips down to the ground. Lift your chest upward and arch your back and look up towards the ceiling.

Benefits: Tones up the body and the back muscles and improves the eyesight. Corrects all kinds of disorders related to the reproductive system, corrects the irregularities in females menstrual cycles. Blood circulation is also improved.

8th Position: *Parvatāsana*



Mantra: *āum hrini maricaye namh |*

Concentration: Neck Centre (*Vishuddhi*).

Procedure: Exhale and without moving your hands and feet, tuck your toes and raise your hips and backside up. Elongate the spine and straighten the knees, spreading the fingers evenly push down from your forearms and try to put your heels down to the ground pushing back the thighs. Let your head hang and try lowering your shoulder blades to broaden the collarbone.

Benefits: One gets relief from the pains – especially of arms, legs and the knees. Bulging waist is trimmed and it is good for the abdominal disorders.

9th Position: *Aśva Sancālanāsan*



Mantra: *āum hrūm ādityāya namaḥ |*

Concentration: Eyebrow Centre (*Ajñā*).

Procedure: Lunge forward while inhaling and bring your right leg in between your hands repeating the position in Step: 4.

10th Position: *Pādahastāsana* (Hand to foot pose)



Mantra: *āum hraini śavitre ṇamah |*

Concentration: Root of spinal column (*Svādhiṣṭhāna*).

Procedure: On exhale, bring the left foot forward next to the right and forward bend into *Pādahastāsana* (**Step: 3**).

11th Position: *Hasta utthānāsan* (Raised arms pose)



Mantra: *āum hroum arkyāa ṇamah |*

Concentration: Neck Centre (*Viśuddhī*).

12st Position: *Praṇāmāsana*



Mantra: *āum hṛaḥ bhāskarāya namaḥ |*

Concentration: Heart Centre (*Anāhata*).

Then come back to the 1st position and repeat the full round once more. Our ancients used to do 25 rounds of *Sūrya Namaskāras*, called one *āvṛutti*. Can you?!



As per the scriptures one who performs the *Sūrya Namaskāra* daily does not get poor in a thousand births.⁽¹⁾

CHAPTER 5

PSYCHO-PHYSIOLOGICAL EFFECTS OF SŪRYA NAMASKĀRA (BASED ON ANCIENT SCRIPTURES)

Sūrya Namaskāra is yogic practice, consist of twelve yoga postures. *Sūrya Namaskāra* is composed of the three elements of form, energy and rhythm. The twelve postures create the physical matrix around which the form of the practice is woven. These postures generate *prāṇa*, the subtle energy, which activates the psychic body. In yogic physiology the body consists of physical, *prāṇic*, mental, intuitive and spiritual components. The more subtle aspects are the more powerful. Mind drives the body. The mind and the body are inseparable. They are intimate and in the final analysis depend on each other for their existence. At the same time, the power of the mind is unimaginable. Yogic techniques aim at developing flexibility in the body and mind.

Sūrya Namaskāra has an effect on *īdā* and *pingalā nādi*. This is especially true when we perform the practice slowly and even more enhanced with the use of mantras or chakra awareness. At the same time there is another aspect of *Sūrya Namaskāra* which helps to induce a positive and vitalized state of mind.

Is yoga enough to keep u fit? The physiological principals involved in the practice of yoga, which are supposed to keep a person fit by practicing it on regular basis. A comparison of muscle strength, endurance, flexibility and lung capacity between yoga practitioners and top performers of different sports has been made and this has revealed some of the most outstanding results.

Sūrya Namaskāra application and versatility make it one of the most useful and complete methods to bring about health and vigor while at the same time preparing an adept for the deeper processes of yoga. It is based on three elements: rhythm, energy and form. Form is evident in the twelve postures which are always performed in the same sequence. Such steady and continuous performance of postures which are coordinated with the breath activates the subtle energy

Called *Prāṇa*. This steady and rhythmic flow reflects the rhythm of the universe, such as biorhythms of the body, which were expressed in the past by the science of the twelve zodiac phases. The rhythmic superimposition of the form and energy of *Sūrya Namaskāra* on our psychosomatic organism is a transforming force since it activates the psychic body in a completely different way than what any modern sport or game can do.

Rāmadāsa swāmī practiced physical yoga exercises as well as meditation. The *Sūrya Namaskāra* or Sun Salutation was his favorite as it involves every part of the body. It is said that he would do 1,200 Sun Salutations every day, believing that no spirituality could be attained if the physical body was not strong. ⁽⁸⁾

5.1 EFFECTS OF MANTRA:

The mantras chanted while performing the *Namaskāra* generate minute vibrations in the body which helps and corrects functioning of all systems and glands in the body. The whole *Namaskāra* process tones up the functioning of all systems in the body like sensory, Respiratory, Circulatory, Digestive and Nervous systems. Balanced state of mind and concentration and wide Memory powers also result ⁽⁹⁾.

5.2 EFFECT ON PANCAKOŚA:

The human being can be thought of consisting of '*Pancakośa*' (or five sheaths) consisting of The *annamaya* (or Body), *prāṇamaya* (or Breath), *manomaya* (or Mind), *vijñānamaya* (or Intellect) and *ānandamayan* (or Bliss) sheaths. These same five *kośas* can be further grouped into Gross (or *sthūla*), the *annamaya* or body sheath, Subtle (or *sūkṣma*) consisting of the *prāṇic*, mental and intellectual sheaths and the Causal (or *kāraṇa*), the Bliss sheath. Properly performed *Sūrya Namaskāra* impacts and influences all five sheaths – the body, the breath, the mind, the

intellect and the bliss – thus providing to the performers of these exercises the benefits for the *sthūla* (Gross), *sūkṣma* (subtle) and *kāraṇa* (Causal) bodies. Whereas Conventional exercises of all forms including aerobic, weight lifting, walking, jogging and running are designed to provide benefits to the physical body and its various component organs including joints and muscles, *Sūrya Namaskāra* provides benefits of a holistic nature by working on the physical body, *prāṇa* (breathing), mind, intellect and the bliss components (or *kośa*) of the entire human personality. In that sense, *Sūrya Namaskāra* can be considered to be a Personality development tool and must be included as part of one's wellness program.

5.3 EFFECT OF SŪRYA NAMASKĀRA ON DIFFERENT SYSTEMS OF BODY:

Sūrya Namaskāra practice interacts with the physical organs of the body directly, by applying pressure, massaging, stretching and generally toning up and supporting internal tissue structures. This aids the eliminative functions as well as stimulating nervous energy. It enhances our wellbeing.

Respiratory System

In *sūryanamaskāra* a deep rhythmic breathing process is synchronized with each movement, which completely empties the lungs of all, traces of stale gas and refills them with fresh, clean, oxygenated air. All the pockets of the lungs are expanded stimulated and then cleaned. The oxygen content of the blood is 150 increased, which improves the overall vitality and oxygenation of the cells and tissue of the body and brain. Sluggishness and lethargy are rapidly overcome. This practice is also good for the prevention of diseases such as tuberculosis, which develop in the little used, stagnant regions of the lungs.

Circulatory System

The regular practice of *sūryanamaskāra* improves flow of blood, to speeds up the elimination of morbid matter and introduces fresh oxygen and nutrient of all the cells, and general circulation is improved. The cardiac muscles are strengthened. Microcirculation to the heart is increased and

reducing the chances of heart attack. Sluggish circulation, cold hands and feet, blood vessel diseases and general fatigue can also be eliminated. The circulation of lymph, which is prime importance in fluid balance and in combating infections, is toned, the body gains an increased resistance to infections, and a better ability to heal.

Digestive System

The alternate stretching and compressing movements of *sūryanamaskāra* tone the whole digestive system by thoroughly massaging all the abdominal viscera. This not only enhances elimination but also increases the digestive fire, promoting a healthy appetite, and complete and rapid assimilation of food.

Skin

The skin is the important and largest body organ and apart from holding the body together serves to regulate body temperature, as well as excreting waste matter through perspiration. When there is an excess of poisonous matter in the blood, it comes out through the skin in the form of boils, rashes and pimples. As *Sūrya Namaskāra* produces perspiration, speeds up circulation and enhances the elimination of wastes through the digestive and urinary systems, it cleanses and endows the Practitioner with a clean, glowing complexion, which is an important sign of health. Many skin disease caused by subcutaneous toxin deposits, such as pimples and eczema, can be removed. Bad odors from the body are eliminated, and the overall circulation of blood to the skin is improved.

When *Sūrya Namaskāra* is practiced in the early morning hours while facing the rising sun, ultraviolet light rays are absorbed through the skin. At sunrise, these rays are at their greatest intensity and are thought to be very beneficial for healthy as well as being responsible for vitamin D production.

Nervous System

In the twelve movements of *Sūrya Namaskāra*, the spinal column is systematically stretched and compressed to the maximum extent, stimulating circulation in the whole spinal cord, and all

nerve plexuses. *Sūrya Namaskāra* tones nerve flows by stimulating internal organs. It stretches organs. It stretches nerves, works on the spine and activates brainCenters. The whole nervous system is activated and seems to wake up.

The Endocrine System

The endocrine glands are the most vital and mysterious of all systems of the body. They play an overall role in the coordination and integration of all physiological process and yet very little are actually known about them. The main function of the endocrine glands is the production and secretion of hormones, chemical substances are released into the bloodstream and carried throughout the body to act upon particular organs.

Pituitary Gland

The pituitary gland is master gland of human body. It has many hormonal secretions, which control the body's growth and development. By increasing the flow of blood to the head and through its effects on the nervous system. *Sūrya Namaskāra* stimulates the hypothalamus, which regulates the pituitary action. The practice of *sūrya Namaskāra* thereby has a direct and beneficial effect on this vital centre and the whole body.

Pineal Gland

The pineal gland is situated in the brain. Yogic Science states that it has a vital function and acts as connecting link between the different levels of awareness above and beyond the Physical plane. *Sūrya Namaskāra* plays an ideal role in the maintenance of this important gland.

Pancreas

The Pancreas is located behind the stomach at the level of the solar plexus. Parts of this important gland produce the hormone insulin, which controls the body's ability to store and utilize sugar.

Sūrya Namaskāra compresses the abdominal organs, which press onto the pancreas especially during backward bending in *bhujangāsana* ^{(10, 11, 12, 13, 14).}

Summary

From the above facts it is clear that *Sūrya Namaskāra* is an ancient knowledge of this country which provides physical and spiritual health by affecting different activities of human body based on body, mind and breath concept. If we follow the sequence of *Sūrya Namaskāra* in proper way then it will be the best way to keep you away from disease and improve your quality of life.

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PART II

**“EFFECT OF SŪRYA NAMASKĀRA ON SUSTAINED ATTENTION IN
SCHOOL CHILDREN”**

ABSTRACT

OBJECTIVES:

To measure the performance of school children in a digit letter substitution task following the practice of *Sūrya Namaskāra* compared to physical exercise.

METHODOLOGY:

- Sample size - 64 subjects selected from 320 students.
- Source - Marathi Medium School in Maharashtra, India.
- Inclusion Criteria – 12 to 14 years, both genders, who understand English & Marathi.
- Exclusion Criteria - Presence of cognitive and / or psychiatric, neurological disorders based on a clinical examination (which was obtained on request from the authorities of the school).
- Design
 - Randomized controlled study design
 - 64 students divided into 2 groups with 32 students each (Experimental group and Control group) by random selection using a random number table.
- Assessment - Assessments were done at baseline (Day 1) and after 30 days of their respective interventions.
 - Digit Letter Substitution Task

12 rows and 8 columns and randomly digits arranged in rows and columns

Procedure - The participants were asked to substitute as many target digits as possible in the specified time of 90 seconds. They were instructed to substitute letter by their own choice either in a horizontal, vertical or randomized manner by selecting the particular digit. The total number of substitutions and wrong substitutions are scored. The net score was obtained by deducting wrong substitutions from the total substitutions attempted (Natu & Agarawal, 1997).

INTERVENTION:

- Starting prayer
- Loosening exercise
- *Sūrya Namaskāra*
- DRT.

RESULTS:

Two groups (*SūryaNamaskāra* and control) assessed after thirty days of respective interventions using a digit letter substitution task showed significant improvements. The data were normally distributed and the baseline data across the groups was not statistically different ($p>.05$).

The pre-post data within each group was analyzed using a paired 't' test. There was a significant increase in number of letters substituted per digits in both yoga ($p<.001$) as well as control groups ($p<.001$). The difference between the groups was statistically not significant.

CONCLUSION:

Physical activity given regularly in a structured manner followed by supine rest improves attention process.

CHAPTER 1

INTRODUCTION

Sūrya Namaskāra signifies paying homage to (Lord) Sun deity. It is a very ancient Indian system of exercise. The roots of this ancient exercise regime lie in Vedic scriptures, which contains numerous *ślokās* referring to the sun.

Facing east, in the early hours of morning, one standing with serene mind offers prayer to Lord Surya with *Sūrya Namaskāra*. Along with physical drill, *Sūrya Namaskāra* has spiritual connotation attached to it. *Sūrya Namaskāra* is a graceful combined sequence of twelve positions. Through this sequence of twelve positions, the whole body is well exercised.

According to the scriptures, if performed correctly, this exercise does not strain or cause injury. If performed in the morning, it relieves stiffness, revitalizes the body and refreshes the mind, it purifies subtle layers, purifies *nāḍīs*, etc. Though the greatness of *Sūrya Namaskāra* has been greatly said in scriptures not much research has been done.

In an earlier study published based on *Sūrya Namaskāra*, it was speculated that *Sūrya Namaskāra* can be an ideal aerobic exercise as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardio-respiratory system⁽¹⁾.

A later study assessed the cardio-respiratory and metabolic responses of four rounds of *Sūrya Namaskāra*, a typical amount performed by practitioners, to determine its potential as a training and weight loss tool. It was found that participants exercised at 80% of age-predicted maximal heart rate (HRmax) during Round 2, 84% during Round 3, and 90% during Round 4. Average intensity during the four rounds was 80% HRmax, sufficient to elicit a cardio-respiratory training effect. Oxygen consumption averaged 26 ml/kg/min during each round, resulting in an energy expenditure of 230 kcals during a 30 min session for a 60 kg individual⁽²⁾.

These findings support the use of *Sūrya Namaskāra* as an effective physical activity recommended by the American College of Sports Medicine i.e., 50% to 80 % VO2 Max and 60% to 90 % heart rate reserve as effective physical activity.

Recently Bhavanani & Colleagues evaluated the differential physiological effects of 6 months training in the fast and slow versions. The results suggested that *Sūrya Namaskāra* has positive physiological benefits as evidenced by an improvement in pulmonary functions, respiratory pressures, hand grip strength and endurance, and resting cardiovascular parameters. It also demonstrated the differences between SN training when performed in a slow and fast manner, concluding that the effects of FSN are similar to physical aerobic exercises, whereas the effects of SSN are similar to those of yoga training⁽³⁾.

While the above two studies have looked at the cardio-respiratory changes and metabolic cost during *Sūrya Namaskāra* in young adults, a single report evaluated its influence on children belonging to 8-14 years of age. The results showed that the Systolic blood pressure, Peak Expiratory Flow Rate and Forced Vital Capacity increased significantly and Respiratory Rate, Heart Rate and Diastolic Blood Pressure decreased significantly after the practice of *Sūrya Namaskāra*.⁽⁴⁾

Apart from physical health and physiological rest, an improved attentional process and cognitive function determines the scholastic performance in school children. While the above studies have looked at *Sūrya Namaskāra* as an effective physical activity and earlier studies have suggested that physical exercise can improve executive functions in school children ⁽⁵⁾. We have designed the present study to evaluate the influence of *Sūrya Namaskāra* on attention span in school children.

CHAPTER 2

AIM AND OBJECTIVES

2.1 AIM

To understand the influence of *Sūrya Namaskāra* on sustained attention in school children.

2.2 OBJECTIVES

To measure the performance of school children in a digit letter substitution task following the practice of *Sūrya Namaskāra* compared to physical exercise.

2.3 HYPOTHESIS

Sūrya Namaskāra increases attention span in school children.

2.4 NULL HYPOTHESES

There is no association between *Sūrya Namaskāra* and attention span.

CHAPTER 3

METHODOLOGY

3.1 SUBJECTS

3.2 DESIGN

3.3 VARIABLES

3.4 DATA EXTRACTION

3.5 INTERVENTION

3.1. SUBJECTS:

3.1.1 Sample size:

64 subjects selected from 320 students studying in a Marathi Medium school in Maharashtra, India. Subjects were screened based on the inclusion and exclusion criteria and the selected 64 subjects were randomly allocated to two groups i.e., *Sūrya Namaskāra* and Physical Exercise. The sample size was calculated based on the earlier study. Accordingly, the present study had a sample size of 32 subjects in each group.

3.1.2 Inclusion Criteria:

- Age range 12 to 14 years, normal healthy students.
- Both genders
- Subjects who would understand instructions given in English, Marathi.
- Motivation to practice and
- Willingness to volunteer for the trial.

3.1.3 Exclusion Criteria:

- Presence of cognitive and / or psychiatric, neurological disorders based on a clinical examination (which was obtained on request from the authorities of the school)
- Children with attention related problems

3.1.4 Source of subjects:

- Students studying in 7th Standard at Chiplun, Ratnagiri (district), Maharashtra, India.

3.2 Design:

- Randomized controlled study design
- 64 students divided into 2 groups with 32 students each (Experimental group and Control group) by random selection using a random number table.
- The signed informed consent was obtained from their parents
- Assessments were done at baseline (Day 1) and after 30 days of their respective interventions
- Experimental group underwent *Sūrya Namaskāra* for a month.
- Control group was given routine physical exercises. This was same as the physical exercises given to all the students in the school except the *Sūrya Namaskāra* group.

3.3 Variables:

Digit-letter substitution task:-

Digit letter substitution test includes visual scanning, mental flexibility, sustained attention and psychomotor speed of information processing. Digit substitution test has already been standardized for use in Indian population (Natu & Agarawal, 1997).

Subjects were made to sit on the desk (two in a desk with a distance of two meters between them). They were given necessary instructions about the task. The DLST consisted of a worksheet which had 12 rows and 8 columns and randomly digits arranged in rows and columns. The participants were asked to substitute as many target digits as possible in the specified time of 90 seconds. They were instructed to substitute letter by their own choice either in a horizontal, vertical or randomized manner by selecting the particular digit. The total number of substitutions and wrong substitutions are scored. The net score was obtained by deducting wrong substitutions from the total substitutions attempted (Natu & Agarawal, 1997).

Variables Recorded:

- The total number of substitutions
- wrong substitutions are scored
- Net score

3.4 Data extraction:

The total number of substitutions and wrong substitutions are scored. The net score was obtained by deducting wrong substitutions from the total substitutions attempted. The scoring was done by the experimenter who was unaware of the names of the subjects to whom the data sheets belonged. This ensured masking of the data while doing the data extraction.

3.5 Plan of analysis:

Data were analyzed using descriptive as well as inferential statistics. The data were assessed for normality distribution using the Shapiro-wilk test. The net scores recorded on Day 30 of *Sūrya Namaskāra* group as well as the Control group were compared with their respective Day 1 values using a Paired ‘t’ test.

3.6 Interventions:

Sūrya Namaskāra has been a traditional Yoga based practice. Sun is the centre of the universe and is considered to be the source of life on planet Earth. From times immemorial, the Sun has been revered as a deity and worshipped. *Sūrya Namaskāra* is a salutation to this powerful celestial body, around which other planets revolve and take light and heat from it. It is believed that whoever worships Lord Surya is bound to have a dynamic personality, as he rejuvenates life and makes one feel young, agile, brilliant and healthy.

Name	Description	Duration
Starting Prayer	<p><i>hiraṇmayena pātreṇa satasyāpīhitāni mukham tatvāni</i> <i>pūṣanna apāvṛṇu satyadharmāya dōuṣhṭaye īṣa upa 1 </i></p> <p>Like a lid to a vessel, Oh sun, your golden orb covers the entrance to the truth. Kindly open the entrance, to lead me to the truth.</p>	30 sec.
Loosening exercise	Finger movement, wrist rotation, shoulder rotation, neck rotation, toe movements, ankle movement & rotation, knee movement, butterfly,	10 mins.
<i>Sūryanamaskāra</i>	<p>Twelve Sun salutations.</p> <p>Step 1: <i>Praṇāmāsana</i> (prayer pose)- Stand erect with your chest out, feet together, knees pulled up and thighs tight like in <i>Tadāsana</i>. Bring your hands forward, in front of your chest as if in prayer, elbows straight and not drooping.</p> <p>Step 2: <i>Hasta utthānāsan</i> (raised arms pose) - On inhale, stretch your arms up over your head, palms still together. Then arching back as far as you can go, stretch with your arms apart</p>	12 mins.

for next pose.

Step 3: *Pādahastāsana* (standing forward bend pose) -

While exhaling, swing down from the hips keeping your upper body and torso straight. Without bending the knees place your hands on either sides of your feet flat on the mat, head as close to your knees as possible.

Step 4: *Aśva Sancālanāsan* (equestrian pose) - Inhale bring the right foot to the back of the mat on the toes like a lunge. Using your finger tips for support and the left leg at a right angle start bending the extended leg at the knee towards the floor and look up.

Step 5: *Dandāsana* (plank pose) - Retain your breath and extend your left leg back on your toes side by side your right without moving the position of your hands and leg at all. Palms flat on the mat, keep your spine straight and elbows locked. Do not let your head or hips drop. It should look like you are about to do a push up.

Step 6: *Aśtanāga Namaskār* (Salute with 8 limbs pose)-

Exhale, bending your elbows towards your body and going down as low as you can at the shoulders while keeping the rest of your body perfectly stiff exactly like a push up. Once down near the floor, bend and drop your knees, chest and forehead to the ground lightly touching in that order. Your hips and pelvic should still be raised. Eight points should be touching the floor in this step- forehead, chest, and two palms, both knees and both feet.

Step 7: *Bhūjangāsana* (cobra pose) - Inhale, while swinging your body forwards, straightening your arms, stretching your

	<p>shoulders upwards and lowering your hips down to the ground. Lift your chest upward and arch your back and look up towards the ceiling.</p> <p>Step 8: Parvatāsana (downward facing dog pose) - Exhale and without moving your hands and feet, tuck your toes and raise your hips and backside up. Elongate the spine and straighten the knees, spreading the fingers evenly push down from your forearms and try to put your heels down to the ground pushing back the thighs. Let your head hang and try lowering your shoulder blades to broaden the collarbone.</p> <p>Step 9: Aśva Sancālanāsan (equestrian pose) - Lunge forward while inhaling and bring your right leg in between your hands repeating the position in (Step: 4)</p> <p>Step 10: Pādahastāsana (standing forward bend pose)- On exhale, bring the left foot forward next to the right and forward bend into Pādahastāsana (Step:3).</p> <p>Step 11: Hasta utthānāsan (raised arms pose)- Straighten the back and raise your arms above your head, palms joined and repeat (Step:2).</p> <p>Step 12: Praṇāmāsana (prayer pose) - Lower your hands in down to your chest as in (Step: 1).</p>	
DRT	<p>Deep Relaxation Technique</p> <p>Relaxation is must for children who face stress in so many ways. Śavasana and various relaxation practices from it can be taught to them. So here I have given DRT (Deep Relaxation Technique).</p>	10 mins.
Closing	Om śāntiḥśāntiḥśāntiḥ	5 sec.

CHAPTER 4

RESULTS

Two groups (*SūryaNamaskāra* and control) assessed after thirty days of respective interventions using a digit letter substitution task showed significant improvements. The data were normally distributed and the baseline data across the groups was not statistically different ($p>.05$).

The pre-post data within each group was analyzed using a paired 't' test. There was a significant increase in number of letters substituted per digits in both yoga ($p<.001$) as well as control groups ($p<.001$). The difference between the groups was statistically not significant.

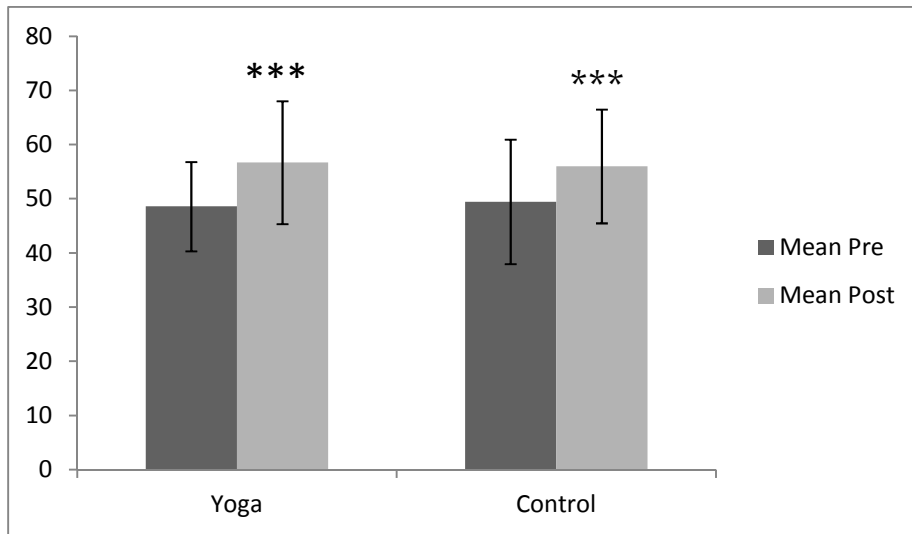
The group mean values \pm Standard Deviations are given in Table 1. The same has been graphically represented in Graph 1.

Table 1: Net scores recorded on Day 1 and Day 30 in both *Sūrya Namaskāra* and Control groups. Values are group mean \pm SD

	Day 1 [Mean \pm SD]	Day 30 [Mean \pm SD]	Percentage change & p value
<i>SūryaNamaskāra</i> group	48.59 ± 8.24	56.71*** ± 11.34	16.7 P<0.001
Control group	49.47 ± 11.47	56*** ± 10.49	13.2 P<0.001

P<.001, post values compared with the respective pre values using paired 't' test

Graph 1: Group Mean \pm SD of Net scores recorded in both *Sūrya Namaskāra* and physical exercise group on Day 1 (pre) and Day 30 (post)



P<.001, post values compared with the respective pre values using paired 't' test

CHAPTER 5

DISCUSSION

64 school children randomly divided into two groups (*Sūrya Namaskāra* & control) assessed using a task requiring attention span showed significant improvements after one month of practice of *Sūrya Namaskāra* or regular physical exercise.

Earlier studies have attempted to understand the physiological changes following *Sūrya Namaskāra*. They have showed a positive change in energy cost and cardio respiratory performance in young adults. It was speculated that *Sūrya Namaskāra* can be used as an ideal aerobic exercise as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardio-respiratory system. Similar observations were made by other researchers⁽¹⁾.

They assessed the cardio-respiratory and metabolic responses to practicing four rounds of *Sūrya Namaskāra*; it was shown that the average intensity during the four rounds was 80% Heart Rate maximum, sufficient to elicit a cardio-respiratory training effect⁽²⁾.

These findings support the use of *Sūrya Namaskāra* as an effective physical activity recommended by the American College of Sports Medicine i.e., 50% to 80 % VO₂ Max and 60% to 90 % heart rate reserve as effective physical activity.

Recently Bhavanani & Colleagues evaluated the differential physiological effects of 6 months training in the fast and slow versions. The results suggested that *Sūrya Namaskāra* has positive physiological benefits as evidenced by improvement of pulmonary function, respiratory pressures, hand grip strength and endurance, and resting cardiovascular parameters. It also demonstrates the differences between *Sūrya Namaskāra* training when performed in a slow (SSN) and fast manner (FSN), concluding that the effects of FSN are similar to physical aerobic exercises, whereas the effects of SSN are similar to those of yoga training⁽³⁾.

While the above two studies have looked at the cardio-respiratory changes and metabolic cost during *Sūrya Namaskāra* in young adults, a single report evaluated its influence on children belonging to 8-14 years of age. The results showed that the Systolic blood pressure, Peak Expiratory Flow Rate and Forced Vital Capacity increased significantly and Respiratory Rate, Heart Rate and Diastolic Blood Pressure decreased significantly after the practice of *Sūrya Namaskāra*⁽⁴⁾.

It is clear from earlier reports that *Sūrya Namaskāra* can be a potential equivalent to aerobic exercise with respect to cardio-respiratory endurance. However, its other applications are being explored recently. Improving scholastic performance in school children has been identified as a major application of *Sūrya Namaskāra* as earlier reports on physical exercise have shown its beneficial effects on improving the executive functions in children⁽⁵⁾.

The results of the present study are in line with the earlier report that physical activity influences attentional tasks. Improvement following the practice of *Sūrya Namaskāra* can be attributed to physical activity interspersed with regulated breathing and relaxation as the influence of relaxation on attention span is well documented. The changes seen in the control group (physical exercise followed by supine rest) are similar to that of the experimental group suggesting that structured physical activity of any form followed by supine rest can induce alert rest.

The group which practiced *Sūrya Namaskāra* had 16.7% improvement compared to 13.2% in physical exercise group. However, the difference between the groups was statistically not significant. The marginal better performance in the *Sūrya Namaskāra* group can be attributed to the aspect of *Sūrya Namaskāra*, i.e. Physical activity interspersed and slow breathing and relaxation as mentioned elsewhere.

The present study indicates that physical activity of any form followed by supine rest can influence the attention processes.

CHAPTER 6

SUMMARY AND CONCLUSION

Summary:

1. One month of training in the practice of *Sūrya Namaskāra* improved the performance of task requiring attention.
2. Exposure to physical exercise followed by supine rest also improved the performance in an attention task.

Conclusion:

1. Physical activity given regularly in a structured manner followed by supine rest improves attention process.

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APPENDIX

A 1: Raw Data: *Sūrya Namaskāra* Group

Name	Age	Total (pre)	Wrong (pre)	Net (pre)	Total (post)	Wrong (post)	Net (post)
1.Atharva Athavale	12	60	0	60	59	0	59
2.Hrishikesh Berde	12	44	0	44	42	0	42
3.Ajinkya Bhakare	13	52	0	52	58	0	58
4.Aniruddha Choudhary	12	40	0	40	50	2	48
5.Atharva Chitale	12	41	0	41	48	0	48
6.Ketan Chitale	14	40	0	40	48	0	48
7.Rohit Desai	12	42	1	41	57	0	57
8.Sagar Deshapande	12	43	0	43	56	0	56
9.Shubham Dhole	12	36	0	36	52	0	52
10.Kshitij Gandhi	12	52	0	52	60	0	60
11.Nisarga Kambale	12	49	0	49	46	1	45
12.Prabhat Kambale	12	43	0	43	53	0	53
13.Devesh Kovale	12	48	0	48	50	0	50
14.Dhananjay Kulkarni	13	32	0	32	57	0	57
15.Hrishikesh Malsure	12	48	0	48	38	1	37
16.Mayuri Aswekar	12	47	5	42	73	0	73
17.Siddhi Bhandari	12	60	0	60	87	2	85
18.Payal Bhosale	12	53	0	53	57	0	57
19.Manaswi Chavan	12	38	0	38	42	0	42
20.Kasturi Chitale	12	65	0	65	72	0	72
21.Devashri Dixit	13	53	1	52	59	1	58
22.Sayali Dixit	12	50	0	50	61	0	61
23.Prithvi Gotad	12	54	0	54	55	0	55

24.Rutu Gudhekar	12	49	0	49	66	0	66
25.Sudha Gunjal	12	60	0	60	76	0	76
26.Rutuja Jabare	12	55	0	55	62	0	62
27.Prajakta Javale	12	48	0	48	49	0	49
28.Samruddhi Joag	13	48	0	48	51	0	51
29.Rasika Joshi	12	63	0	63	56	0	56
30.Shivani Kadam	12	54	0	54	56	0	56
31.Akshata Kalbote	12	39	0	39	44	0	44
32.Siddhi Khapare	12	56	0	56	82	0	82

Control Group:

Name	Age	Total (pre)	Wrong (pre)	Net (pre)	Total (post)	Wrong (post)	Net (post)
1.Parag Mane	12	55	1	54	64	0	64
2.Sarvesh Mehta	12	44	0	44	43	0	43
3.Ameya Patil	12	45	0	45	46	0	46
4.Prathamesh Patil	12	52	0	52	48	0	48
5.Shubham Pedhambkar	13	42	0	42	45	0	45
6.Soham Phanse	14	36	0	36	37	0	37
7.Aditya Sushil	12	37	0	37	45	0	45
8.Prathamesh Sannak	12	56	0	56	62	0	62
9.Hrushikesh Shetye	12	55	0	55	62	0	62
10.Pushkar Shitut	12	42	1	41	48	0	48
11.Pushkaraj Ranade	12	47	0	47	56	0	56
12.Siddhesh Ranade	12	35	0	35	40	0	40
13.Devashish Rane	12	32	0	32	35	1	34
14.Sumit Rathod	13	54	0	54	62	0	62
15.Yatin Tambade	12	44	0	44	50	1	49
16.Manali Kulkarni	12	44	0	44	64	0	64
17.Mukta Mirlekar	12	56	0	56	68	0	68
18.Pranoti Mane	12	69	0	69	72	0	72
19.Ruchia Mutalik	12	45	0	45	47	0	47
20.Namrata Patil	12	51	0	51	68	0	68
21.Sukanya Pedhambkar	12	67	0	67	59	0	59
22.Pradnya Petkar	12	45	0	45	52	0	52
23.Anagha Raut	12	76	0	76	63	0	63
24.Anuja Shinde	12	46	0	46	60	0	60
25.Pranali Shinde	12	61	0	61	68	0	68

26.Piyush Shirke	12	44	0	44	61	0	61
27.Pranali Shirolkar	12	44	0	44	57	0	57
28.Rujuta Soman	12	77	0	77	77	0	77
29.Nidhi Surve	12	50	0	50	60	0	60
30.Falguni Tambe	12	32	2	30	62	1	61
31.Swarada Thatte	12	48	0	48	60	0	60
32.Samruddhi Yadav	13	56	0	56	54	0	54

A 2: Photos

Sūrya Namaskāra & control group:



Sūrya Namaskāra Practices





DRT (Deep Relaxation Technique)



A 3: Consent form

Consent Form

Informed Consent

Dear parents/guardians/headmaster,

We take this opportunity to introduce Mr. Parag Javadekar, a student in the final semester of a Masters Program in Yoga & education at Svāmi Vivekānanda Yoga Anusandhāna Samsthāna (SVYASA), Deemed University, Bangalore, India. As a part of his research interests and Masters Program requirements, he will be conducting a study at United English School. Please read the following details regarding a Yoga Program that will be provided to your child.

Please read the details below to provide consent in the end.

THE STUDY: This will be a small research program to assess the ‘Effect of *Sūrya Namaskāra* on Sustained Attention in School Children’. Children will be randomly allocated to either of the two groups i.e., *Sūrya Namaskāra* or physical activity. This study involves supervised practice of *Sūrya Namaskāra* for a period of one month. Recognized and widely used tests will also be administered to understand children attention levels.

YOGA PROGRAM DETAILS: The Yoga program will be conducted at the school premises for 45 minutes a day for 6 days a week.

CONFIDENTIALITY: Results obtained in this study will be kept confidential and no child will be exposed during any part of the research work. Parents can obtain information about their child performance in this study from the researcher.

If you have any questions please feel free to contact here at United English School.

This information is to encourage your child to attend the same.

Your Child’s Name: _____

Please sign this form as: ‘I willingly enroll my child into the program’

Note: The Yoga program will be conducted within school time. Classes will be arranged in such a way that there will be a minimum impact on regular classes.

Name & Signature of Parent

Name & Signature of researcher

A 4: Sample copy of the Digit Letter Substitution Test

Swami Vivekananda Yoga Anusandhana Samsthana (Deemed University), Bangalore.

Name :

Date:

Age:

Sex:

DIGIT LETTER SUBSTITUTION TEST (A)

Instructions:

- 1. Substitute the digits with corresponding letter as per the given key.**
 - 2. Substitute as many possible within the given time.**
 - 3. Start and stop only when told.**
-

Substitute Letters:

1	2	3	4	5	6	7	8	9
J	Y	N	H	R	T	D	E	L

6	2	4	1	5	7	9	3	2	6	8	5

5	4	7	8	1	2	3	4	9	6	3	7

2	4	6	7	8	9	3	1	2	3	7	4

2	9	4	6	8	1	2	5	9	3	4	7

9	7	4	2	3	8	1	5	6	2	9	1

8	6	2	3	9	4	5	7	1	4	3	9

3	5	9	1	2	5	6	2	7	8	9	1

5	4	9	2	7	1	3	2	8	9	5	6

Total attempted:

Wrongly attempted:

Net score: