

CERTIFICATE

This is to certify that Jayanta Das is submitting this literature research “CONCEPT OF YAMA IN YOGIC TESTS AND SPRITUAL LORE” and experimental research on “ENERGY EXPENDITURE DURING VRKṢĀSANA, A YOGIC STANDING BALANCING POSTURE” in partial fulfillment of the requirements for Masters of Science (Yoga) registered in Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA) and this is the record of work carried out by him in this university.

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DECLARATION

I hereby declare that the work presented in this dissertation is done by me. The literary and experimental research is under the guidance of Dr. R. Nagarathna and Dr. H. R Nagendra. I also declare that this work entitled:

PART 1

CONCEPT OF YAMA IN YOGIC TESTS AND SPRITUAL LORE

PART 2

ENERGY EXPENDITURE DURING VRKṢĀSANA, A YOGIC STANDING BALANCING POSTURE

has not previously formed the basis of any degree, diploma, membership or similar titles.

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At the threshold of completing M Sc, I feel an undescrivable joy and I owe a deep sense of gratitude to all those who have helped to make this possible.

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Above all, I surrender every bit of success in my life to the almighty God.

Transliteration codes with diacritical symbols

अ	आ	इ	ई	उ	ऊ	ऋ	ॠ
a	ā	i	ī	u	ū	ṛ	ṝ
ऌ	ॡ	ए	ऐ	ओ	औ	अं	अः
ḷ	ḹ	e	ai	o	au	aṁ	aḥ
क	ख	ग	घ	ङ			
ka	kha	ga	gha	ṅa			
च	छ	ज	झ	ञ			
ca	cha	ja	jha	ña			
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 OF YAMA

IN YOGIC TEXTS AND SPIRITUAL LORE

From P. No. 1 to 39

PART – II EXPERIMENTAL RESEARCH

ENERGY EXPENDITURE

DURING VRKṢĀSANA –

A YOGIC STANDING BALANCING POSTURE

From P. No. 1 to 97

PART – I

**CONCEPT OF YAMA
IN YOGIC TEXTS
AND SPIRITUAL LORE**

PART – I LITERARY RESEARCH

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TEXTS AND SPIRITUAL LORE**

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PART – II EXPERIMENTAL RESEARCH

**ENERGY EXPENDITURE
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ABSTRACT

This study is aimed at finding out how the first limb of Aṣṭāṅga Yoga, i.e. *Yama*, is presented in Yoga Sūtras of Patañjali as well as in various spiritual texts such as in Śiva Saṁhitā, Yoga Saṁhitā, Haṭha Yoga Pradīpikā, Bṛhad-yogi-yājñavalkya-smṛtiḥ etc.

Yama has a great role to play in the constitution of completeness of the Aṣṭāṅga Yoga. This is an integral part of Rāja Yoga and the first limb of this text. Thus, it shares an integral approach towards the Aṣṭāṅga Yoga as well as in Rāja Yoga. It has significant role like limbs of the body and works together in various ways to give a complete skeleton for Aṣṭāṅga Yoga.

Yama means to ‘control’ or mastery over ethical disciplines like Ahimsā, Satya, Asteya, Brahmacharya and Aparigraha. On the other hand, *Yama* is ‘discipline’. Discipline is methodicalness. With the application of any or more methods of *yama*, society can be developed in almost all levels i.e. physical, mental, social and spiritual.

According to *Patañjali*, *Yamas* are abstention from harming others (Ahimsā) , from false-hood (Satya), from theft (Asteya), from incontinence (Brahmacharya) , and from greed (Aparigraha). Śaṅkara says, harmlessness, truth speaking, non-stealing, *brahmacharya*, not holding possessions are the required restraints or the *yamas*. In Haṭha Yoga Pradīpikā they are non-violence (Ahimsā), truth (satyam), non-stealing (asteyam), continence (brahmacharya), forgiveness (kṣamā) , endurance (dhṛtiḥ) , compassion (Dayā), humility (arjavam), moderate diet (mitāhārah) and cleanliness (śaucam). In Haṭharatnāvalī *yama* are: mental pleasure, contentment, keeping silence,

control of the senses, compassion, politeness, belief in the Supreme, straightforwardness, softness, forgiveness, purity of thought or emotion, non-violence, abstinence, patience and forbearance.

In *Patañjali's Rāja Yoga* only five items of *yama* are specified. In *Haṭha Yoga Pradīpikā* we get ten items and *Asteya* is not included in *yama* as in *Rāja Yoga*. However, the *Haṭharatnāvalī* says: there are fifteen *yamas*. Here *truth (Satya)* is not in *yama* but in *niyama*.

Thus, though there are differences in number and position of items under *yama* according to various texts, but the importance of *yama* in removing the gross impurities of ordinary minds cannot be over emphasised. It is no doubt that they deal with the moral qualities and general mode of life.

Yama is the fundamental basis for all the yogic practices. It is a transcendent morality based on the higher laws of Nature and organized with a view to bring about the liberation of the individual from the bonds of illusion and ignorance. Not only is the impact of these moral values enormous in daily life, the strictures under *yama* may knit all of us in one spiritual thread.

The present study is undertaken to have a comprehensive view of the *Yamas*, concepts of *Yamas* and their types as delineated in various Yogic Texts and scriptures. The word *Yama* comes from the Saṁskṛta root '*yam*' meaning 'to control'. This first limb is A SET OF DON'T'S (PROHIBITIONS).

The report begins with general ideas about *Yama*. After which the yogic texts which speak about *Yamas* are mentioned. Then each of the *Yama* is separately discussed. The aim of *Yama* is to elevate the personality of a *sādhaka* to the higher levels of yoga *sādhanā*.

The report gives the concept of *Yama* as per various texts. In Haṭha Yoga Pradīpikā, Svātmarama describes *Yama* as a pre-requisite value in yogic practice. In Haṭharatnāvalī, we notice that Srinivasa claiming himself to be an exponent of Haṭha Yoga, and differs from his predecessors in his view of what is Yama.

The transliteration of the Saṁskṛta words and their meanings are also given. The report closes with a Summary and Conclusion.

CHAPTER – 1

INTRODUCTION

The system of *Yoga* put forward by *Patañjali* has eight “limbs” and is therefore called *Aṣṭāṅga Yoga*. Other systems which are based on different techniques naturally adopt other classifications and can have a different number of *Āṅgas*.

यमानियमासनप्राणायामप्रत्याहारधारणाध्यानसमाधयोऽष्टावङ्गानि । प. यो. सू. २.२९ ।

*Yama-niyamāsana-prāṇāyāma-pratyāhāra-dhāraṇā-dhyāna-samādhayo’ṣṭav-
aṅgāni.* [P.Y.S : 29]

Self-restraints, fixed observances, posture, regulation of breath, abstraction, concentration, contemplation, and trance are the eight parts (of the self-discipline of *Yoga*).

The *Yoga Sūtras* or Aphorisms of *Patañjali* set out the system of *Rāja Yoga* as eight limbs or stages or subdivisions (*Aṣṭāṅga*, literally means with eight limbs). These are given in the chapter II, *Sūtra* 29, as follows, the Sanskrit term being given here with a simple translation for each:

- | | |
|-----------------------|---|
| (1) <i>Yama</i> | a set of DON'Ts or self-restraint |
| (2) <i>Niyama</i> | a set of DO'S or self-discipline or fixed observances |
| (3) <i>Āsana</i> | physical posture |
| (4) <i>Prāṇāyāma</i> | control or regulation of breath |
| (5) <i>Pratyāhāra</i> | control or withdrawal of the senses |
| (6) <i>Dhāraṇā</i> | concentration |
| (7) <i>Dhyāna</i> | meditation, contemplation |
| (8) <i>Samādhi</i> | superconsciousness or absorption |

The first two limbs are essential preliminary preparations or requirements and deal with morality and ethics. The next three are concerned with the discipline of the body and the senses. These five are ‘together’, thus external preparation (*bahiraṅga*) or indirect practices to gain mastery over the mind.

The last three limbs are internal (*antaraṅga*) and overall aspects of mind control or direct practices to gain mastery over the mind.

Yoga is a form of training that must be self-chosen and self-imposed. If the prescribed practices are followed conscientiously the result can be surprisingly striking: a healthy body, a one-pointed mind, an awakened intuition.

Our first lesson begins with the two aspects of behaviour, SELF-RESTRAINT (*yama*) and SELF-DISCIPLINE (*niyama*). On their own they do not constitute Yoga, but they are essential preliminary preparation for the practice.

The Saṁskṛta word *yama* literally means restraint, restraint with regard to one’s behaviour, self-restraint. It has been expressed in many ways by different authors: a set of don’ts: abstention, harmlessness, control or self-control, forbearance, refusal, purification, avoidance. By tradition there are five restraints, which are usually expressed as a set of ‘Don’ts’ or as negations, “thou shalt not”.

Yama is the foundation for the eight level structures. It is pivotal for the whole development of *Sādhanā* which depends on the depths and strength of this foundation. There is no short cut to advance in any pursuit without this discipline called *Yama*. Not only in the spiritual purification but also in the secular pursuit like business, social life, service activities, politics etc., *Yama* is essential. It ensures credibility to both the individual and the institution.

The *Yoga Sūtras* of *Patañjali* appeared during a time when *Yoga* was no longer the practice of a few, but had become very popular as a result of the spread of Buddhism, Jainism, and other non-orthodox religious practices which modified Yogic theory and interpretation to suit their respective sectarian cults and beliefs. This led inevitably to the loosening of some strict *Yoga* rules and principles of practice. In particular the principle of the purification of the mind as a preparation for a higher spiritual vision was greatly influenced by the sectarian ideas and imagery

and the goal became the achievement of ecstatic union with one's chosen deity (*Iṣṭadevatā*). This in turn led in some cases to a less strict observance of the moral discipline current in ascetic and *Yoga* schools, and in extreme cases even led to its obliteration. In this situation *Patañjali*'s text sets standards for the practice and aims of *Yoga* which, while allowing some space for different conceptions of the nature of existence, the final goal and the role, if any, of God in *Yoga* -were so impressive and found such strong consensus that they were soon well regarded by all. The *Yoga Sūtras*, therefore, came to be viewed as a classical text of *Yoga* and have remained so practically till the present day. They represent the strict, sober and sincere trend in *Yoga* as it was followed by generations of earnest, seekers of truth over many centuries, a trend that had previously found expression only in Buddha's eightfold path, from which *Patañjali* obviously benefited. And *Patañjali*'s *Yoga-Sūtras* is considered to be the most authoritative treatise on *Yoga*. Condensed in one hundred and ninety-six *Sūtras* or aphorisms, they are the essential philosophy and technique of *Yoga*. Over the years, scholars and teachers of *Yoga* have attempted to expand these *Sūtras* with commentaries and explanations. And nowadays this unique philosophy is well-known to us as *Rāja Yoga*.

Rāja-Yoga is divided into eight limbs. The first is *Yama*-harmlessness, truthfulness, non-stealing, continence, and non-receiving of any gifts. Next is *Niyama*—cleanliness, contentment, austerity, study, and self-surrender to God. Then comes *Āsana*, or posture; *Prāṇāyāmā*, or control of *Prāṇa*; *Pratyāhāra*, or restraint of the senses from their objects; *Dhāraṇā*, or fixing the mind on a spot; *Dhyāna*, or meditation; and *Samādhi*, or superconsciousness. *Yama* and *Niyama*, as we see, are moral trainings; without these as the bases no practice of *Yoga* will succeed. As these two become established, the *Yogī* will begin to realize the fruits of his practice; without these it will never bear fruit. A *Yogī* must not think of injuring anyone, by thought, word, or deed. Mercy shall not be for men alone, but shall go beyond, and embrace the whole world.

The root of the tree is *Yama*, which comprises the five principles of *ahimsā*, *satya*, *asteya*, *brahmacarya*, and *aparigraha*. These set of DON'TS are the five organs of action which are the five karmendriyas (the arms, the legs, the mouth, the organs of procreation, and the organs of excretion). Naturally, the organs of action control the organs of perception and the mind – if one intends to do harm but the organs of action refuse to do it, the harm will not be done. The *Yogī*, therefore, begins with control of the organs of action; *Yama* is thus the root of the tree of *Yoga*.

So, it is better to go step by step, beginning from *Yama*. Lacking restraint in life, there is a possibility of developing mental distractions. It is one of the main reasons for failure in the path of Yoga. It should not be practiced in a hurry; it should happen. There should be no haste.

CHAPTER: 2

AIMS AND OBJECTIVES

1. To cull out from *Yogic* Scriptures the Concept of *Yama*.
2. To bring out the differences in their definitions and to evolve its holistic concept.
3. Relating its significance and relevance to modern society.

CHAPTER – 3

INFORMATION AND SOURCES

3.1. INFORMATION:

अहिंसासत्यास्तेयब्रह्मचर्यापरिग्रहा यमा :। प. यो. सू. २.३० ।

Ahiṁsā-satyasteya-brahmacaryaparigraha yamāḥ. (Verse 30; section II)

Yama is the word derived from the root ‘*yam*’ which, as a verb, means to control, to tame. The word may be interpreted as “abstinence”. It represents the conscious endeavour on the part of the *Yogī* to abstain from doing things that keep the mind involved in the indiscriminate struggle for survival and satisfaction within the existing scale of values in life. Although the stress seems to lie in abstaining, which is a negative concept, the contents of the “abstinences” are positive.

Yama, the first *Aṅga* of *Yoga* is meant to provide an adequate moral foundation for the *Yogīc* training. The very fact that *Yama* and *Niyama* are placed before the other *Aṅgas* shows their basic character: they are deal with moral qualities and general mode of life.

AHIMSĀ is the first of the self-restraints. *Ahiṁsā* means non-violence, abstaining from killing and hurting other beings. Its elementary form is the injunction “thou shalt not kill”, but it goes beyond the usual interpretation of the commandment and includes the non-killing of animal life but also includes non-injury.

Ahimsā really denotes an attitude and mode of behavior towards all living creatures based on the recognition of the underlying unity of life.

The aspirant should begin by examining his behaviour in terms of a desire not to cause pain to any creature. Desire will then be changed to determination as the wish is expressed in action.

Ahimsā is a great universal duty which a man should impose on himself in all conditions of life, everywhere and at all times without being restricted or qualified by any limitation whatsoever.

SATYA is the second of the self-restraints, “not to lie”; the literal meaning of *satya* is truth.

We shall not say what we know to be false. Nor shall we mislead others by inferring that we know something when we are only guessing or making dogmatic assumptions. It implies that we shall not make rash, hasty judgments. This restraint must, however, be given a much broader meaning: to be true in thought and deed, as well as in word.

The aspirant should begin each day by setting himself the ideal of truthfulness in its broadest sense. An experienced *Yogī* should be able to say that he has done what is best for the promotion of what is good, so far as his knowledge enabled him to judge.

Satya is truthfulness and implies abstaining from telling lies and from falseness of any kind. This second moral quality denoted by the word *Satya* has also to be taken in a far more comprehensive sense than mere truthfulness. It means strict avoidance of all exaggerations, equivocation, pretence and similar faults which are involved in saying or doing things which are not in accordance with what we know as true.

ASTEYA is the third of the self-restraints: not taking other people’s property by stealth or force, not to steal. At the mental level this also means non-covetousness.

Asteya literally means abstaining from stealing. As with the other injunctions, here also we have to take the word in a very comprehensive sense and not merely interpret it in terms of the penal code.

“Thou shalt not covet”: it is first the desire to possess what other people have that leads to the active taking of their possessions. But the mere thought of coveting what other people have upsets one’s emotional and mental equilibrium. It makes one feel dissatisfied, envious

Thus, *Asteya* is the virtue of abstaining from stealing. Theft is unlawfully things, belonging to others, one’s own. Abstinence from theft consists in the absence of the desire thereof, or even coveting them.

BRAHMACARYA is the fourth of the self-restraints, not to be sensual. Or put as an injunction, to exercise self-restraint in all things, but especially with regard to sexual appetite.

Brahmacarya is derived from *Brahma*, the supreme Soul, and *charya* meaning external acts of worship. Thus the combined word literally means worship of the Supreme Being and is, therefore, more correctly interpreted as a “life of holiness, especially religious studentship”. Its broad meaning is, therefore, a life of sacred study, devotion for divine wisdom and learning. A simple translation is “spiritual conduct”.

It (continence) is the restraint of the generative organ and thorough control of sexual tendencies. Of all the virtues enjoined in *Yama-Niyama* this appears to be the most forbidding and many earnest students who are deeply interested in *Yogīc* philosophy feel shy of its practical application in their life because they are afraid they will have to give up the pleasures of sex-indulgence.

So, this is the first thing which must be clearly understood with regard to *Brahmacarya*. The practice of higher *Yoga* requires complete abstinence from sex life and no compromise on this point is possible.

The second point to note in this connection is that *Brahmacarya* in its wider sense stands not only for abstinence from sexual indulgence but freedom from craving for all kinds of sensual enjoyments.

Thus, “chastity in thought, word and deed” refers to celibacy or sexual abstinence.

APARIGRAHA is the fifth of the self-restraints, non-greed, not to be avaricious. The Saṁskṛta word is derived from *graha*, grasping or grabbing, and

pari, allround; the “a” makes it negative, “non”. It is therefore another aspect of non-stealing or non-covetousness. Non-stealing is not taking what belongs to another; non-acquisitiveness is not hoarding what one does not need.

So, *Aparigraha* is want of avariciousness, the non-appropriation of things not one’s own; one happens to attain it on seeing the defects of attachment and of the injury caused by the earning, preservation and destruction of the objects of sense.

These five vows, not conditioned by class, place, time or occasion and extending to all stages constitute the Great Vow.

The power (siddhis) behind each vow of yama is also described in *Rāja Yoga*. Here we see that *Patañjali* gives the specific results of practicing the five elements of *Yama* as well as each element of *Niyama*.

If the practice of ‘*ahimsā*’ by anybody attains the highest degree of perfection, then that person has no enemy in the world. Not to speak of human beings, even the wild animals and venomous reptiles do not cause him any injury. On being firmly established in non-violence there is abandonment of hostility in presence of such a person.

With establishment of harmlessness, when it is firm and clear of contrary ideas, *in his presence enmity is abandoned*; in the presence of that one that follows harmlessness, even natural enemies like snake and mongoose give up their antagonism.

In being firmly established in truthfulness fruit (of action) rests on action (of the *Yogī*) only.

Practice of truthfulness develops and purifies *Buddhi* in a remarkable manner and the mind of the person who has acquired perfection in this virtue becomes like a mirror reflecting the Divine Mind to some extent. He has become, as it were, a mirror of Truth and whatever he says or does reflects at least partially that Truth. Naturally, whatever such a person says will come true; whatever he attempts to accomplish will be accomplished.

On being firmly established in honesty all kinds of gems present themselves (before the *Yogī*). Thus, with establishment in non-stealing, all precious things come to him.

It appears also that in ‘asteya’ *Patañjali* includes all the qualities like frankness, honesty and rectitude. If an ‘asteya’ of this description is acquired by an aspirant all that is worth having comes to him as there is nothing more precious in the world than character.

On being firmly established in sexual continence vigour (is) gained. With establishment in brahmacarya, attainment of energy is gained. From that attainment of brahmacarya, he draws out invincible good qualities; he brings them out without limit from himself. He has irresistible energy for all good undertakings and he cannot be thwarted by any obstacle.

He becomes able to confer knowledge on proper and virtuous pupils.

When perfection in *Aparigraha* is attained the *Yogī* acquires the capacity to know the ‘how’ and ‘wherefore’ of birth and death.

This is what the Science of *Yoga* has proved. To the *Yogī* who has obtained even a faint glimpse of these mysteries the remarkable achievements of Science in the realm of matter and force pale into insignificance and seem hardly worth bothering about in the presence of the grandeur of the depth of Truth.

3.2. SOURCES:

1. *Patañjali 's Yoga Sūtras*
2. *Haṭha Yoga Pradīpikā*
3. *Śiva Saṁhitā*
4. *Yoga Saṁhitā*
5. *BṛhadYogīyājñavalkyaśmṛtiḥ*
6. Various lectures in SVYASA University, Bangalore.
7. *Rāja Yoga* – Swami Vivekananda

8. *Patañjali's Yoga Sūtras*–Swami Vivekananda Yoga Anusandhana Prakashana, Bangalore
9. The Science of Yoga, Taimni.
10. *Haṭharatnāvalī*

CHAPTER – 4

YAMA ACCORDING TO SĀSTRAS

4.1. *YAMA ACCORDING TO ŚAṄKARA.*

In ‘*Śaṅkara on the Yoga Sūtras*’ by Trevor Leggett we find a detailed discussion on *Yama*. A brief account is attempted here.

Sūtra II-29 describes:

Restraints, observances, posture, restraint of vital currents, dissociation, concentration, meditation, Samadhi are the eight methods.

But in other *Yoga* scriptures there are only six methods--the one from posture onwards. They say, ‘The *Yoga* of six methods is how expounded’, and so on. For

posture and those which follow it do directly help towards *Samādhi*; not so the restraints and observances.

The objection does not hold, because following the restraints and observances is the basic qualification to practice *Yoga*, for the holy text says: ‘But he who has not first turned away from his wickedness, who is not tranquil and subdued, or whose mind is not at rest, he can never obtain the Self (even) by knowledge (Katha 1.2.24). And the Atharva text, ‘It is those who have tapas and brahmacharya, in whom truth is established’ (Praśna Up.I.15) and in the *Gītā* “Firm is their vow of *brahmacharya*” (VI.14). So the restraints and observances are methods of *Yoga*.

Of the two, restraint is mentioned first to emphasize its supreme importance. For it is everywhere recognized that restraint is of the highest importance. When a *Yogīn* is qualified by practicing restraint and observance he can go on to the posture, and other steps. Becoming steady in each preceding one he is able to master the next. But if he has not mounted the previous step, he cannot get on to a higher one.

Then as in *Sūtra II.30* we find:

Harmlessness, truth speaking, no stealing, *brahmacharya*, not holding possessions are the restraints or the *yamas*.

Of these, harmlessness means, in no way and at no time to do injury to any living being. The other restraints and observances are rooted in this, and they are practiced only to this to its culmination, only for perfecting this. They are taught only as means to bring this out in its purity. For so it is said: Whatever many vows the man of Brahman would undertake, only in so far as he thereby refrains from doing harm impelled by delusion, does he bring out harmlessness in its purity.

Of these methods, first of all the restraints are described. *Harmlessness, truth-speaking, no stealing, brahmacharya, not holding the possessions, are the restraints. Of these, harmlessness(a-himsā) means in no way in no capacity and in no fashion to do injury to any living being, to give pain to any being, whether immobile or active.*

That harmlessness, most important among the restraints and observances, is to be practiced in every capacity—body, speech and mind – he shows by saying, *the other restraints* truth-speaking and so on *are rooted in this*, they have harmlessness as

their goal, have this as their purpose, *and they are practiced only in order to bring this to its culmination, only for perfecting this*. Perfection in harmlessness is their culmination. He further explains: *they are taught only as means to bring this out in its purity*, to bring about harmlessness in all its purity. *Truth-speaking is said to be speech and thought in conformity with what has been seen or inferred or heard on authority. The speech spoken to convey one's own experience to others should be not deceitful, nor inaccurate, nor uninformative. It is that uttered for helping all beings. But that uttered to the harm of beings, even if it is what is called truth, when the ultimate aim is merely to injure beings, would not be truth. It would be sin.*

Undertaking various vows of truth and the others and also other vows not in conflict with them, in operative, in as much as one is withdrawn from the excitement which causes it; then in the absence of that cause, a very pure harmlessness arises. As, for instances, if vowed to a life of begging, occasions of injury like ploughing cease for him.

Truth-speaking is said to be speech and thought in conformity with what has been seen or inferred or heard on authority. That is truth. When there is knowledge arrived at through accurate means of knowledge, the communication of that knowledge just as it is to another by speech and mind is the very operation called truth-speaking. He continues: *The speech spoken to convey one's own experience to others should not be deceitful*, as when one states what one knows to be a fact, but this is very truth is being spoken with the aim of tricking some other person. So Yudhisthira said, 'Aśvatthāmān is killed- I mean the elephant.' (The second part of the sentence was spoken in a low voice, and the hearer believed it was his own son Aśvatthāmān who had been killed—Tr.)

Nor inaccurate as when one speaks what is untrue in the belief that it is true, *nor uninformative*; in appropriate to enlighten the hearer, as when the speech is characterized by ambiguous expressions and inconclusive arguments, dark sayings or archaisms and the like.

That which is thus free from defects, and spoken with sincerity *uttered for helping all beings* makes truth glorious; *but that uttered to the harm of beings* though it may have the force of fact, does not amount to truthfulness, *even if it is what is*

called truth, being without defect in what is said, when the ultimate aim is merely to injure beings, that would not be truth, for what is based on injuring others, even though free from the three defects of speech, does not amount to truth.

It would be a sin. And furthermore, by that hypocritical gloss of righteousness, the appearance of truthful utterance, the deceiver will come to regions of deep darkness. Therefore let one take care that his speech is for the welfare of all. As it is said:

Let one speak what is true, let one speak what is kind,

Let him not speak what is true but unkind;

Let him speak what is kind and not untrue,

That is the eternal righteousness.

(Manu 4.138)

Stealing is the improper appropriation to oneself of others' things: refusal to do it, in freedom from desire, is non-stealing.

Stealing is the improper appropriation to oneself of others' things under the impulse of desire: refusal to do it is non-stealing. The stealing cannot exist in those whose desire has been cut off, and the refusal of that stealing arising from absence of the desire is non-stealing.

Brahmacarya is restraint of the sex organ, the sexual and other senses, by a man who frees himself from urgings, whether verbal or mental, to break the vow.

Seeing the defects in objects involved in acquiring them, and defending them, and losing them, and being attached to them, and depriving others of them, one does not take them to himself, and that is not holding possessions.

Seeing the defects in objects involved in acquiring them and defending them, and losing them and being attached to them, and depriving others of them, one does not take them to himself, he does not appropriate them to himself, does not take them, and that is not holding possessions. It does not mean failure to appropriate them because of impossibility of doing so.

The above are the restraints.

But these, when plasticized universally without qualification of birth, place, time, or obligation, they are called the Great Vow. (*PVS: II. 31*).

When instance, harmlessness qualified by birth would be that of fisherman, where he does injury to fish alone but to nothing else. It may be qualified by place, 'I will not kill anything at a place of pilgrimage', or by time, 'I will not kill on the fourteenth day,' 'I will not kill on an auspicious day'. Even where not limited in these three ways, it may be qualified by obligation. Harmlessness and the others are to be maintained all the time and in all circumstances and in regard to all objects without any conscious lapse. Restraints so practiced are said to be universal, and are termed the Great Vow.

But these: this is to rule out the idea that qualifications like birth, place, and time, which distinguish other dharma-s, must apply to these also. Harmlessness and the other restraints, as they are undertaken by renunciates, are called the Great Vow. That is to say, they are called the Great Vow when practiced regardless of birth and place and time, and universally. The Great Vow is one that is great, whose greatness lies in its universality.

To explain this universality he instances the particular case of harmlessness (*a-himsā*) as universal. It might for instance discriminate between species, as a fisherman who does injury to fishes alone and not to others. This is doing injury to the fish species, and as his harmlessness is qualified in respect of fishes and not applied to the fish class, it is not universal.

It may be qualified by place. How? 'I will not kill anything at a place of pilgrimage' such as Prayāg. Harmlessness at holy places, but not extending to places other than those, is not universal.

It may be qualified by time, 'I will not kill on the fourteenth day' and 'I will not kill on an auspicious day'. As not extending to times other than the fourteenth day or auspicious days, this too is not universal.

Even where not limited in these three ways, it may be qualified by obligation, obligation being some rule of duty, as that one might catch fish only or offering to gods or Brahmins, and not otherwise; and as this makes the exception of the circumstances of the obligation laid down by his faith and so on, it is not universal; Again there are examples of warriors who resolve. 'I shall kill in battle only, and not off the battlefield', and this limits his harmlessness by obligation.

These restraints *harmlessness and the others are to be maintained* without any restriction as to species, such as the species already mentioned, or place or time or obligations, *all the time and in all circumstances and in regard to all objects* all living beings *without any conscious lapse*, unwaveringly; these are then *universal, and are termed the Great Vows* of self-restraint comprise abstention from violence, falsehood, theft, incontinence and acquisitiveness.

4.2. YAMA ACCORDING TO HAṬHA YOGA PRADĪPIKĀ

Svatmarama (author) in *Haṭhapradīpikā* does not include *yamas* and *niyamas* among *Yogāṅgas*, but he accepts their pre-requisitory value in *Yogīc* practice.

According to *Haṭhayogapradīpikā* there are four components of *Haṭha Yoga* viz

Āsana (आसन), *Prāṇāyāma* (प्राणायाम), *Mudrā* (मुद्रा) and “*Nādānusandhāna*”

(नादानुसंधान).

अथ यमनियमाः

अहिंसा सत्यमस्तेयं ब्रह्मचर्यं क्षमा धृतिः ।

दयार्जवं मिताहारः शौचं चैव यमा दश ॥ ह. यो . प्र.: १. १६ (२)

Ahimsā satyamasteyam brahmacaryam kṣamā dhṛtiḥ
Dayārjavaṁ mitāhāraḥ śaucam caiva yamā daśa|| [H.Y.P.: 1.16 (ii)]

Non-violence, truth, non-stealing, continence (being absorbed in a pure state of consciousness), forgiveness, endurance, compassion, humility, moderate diet and cleanliness, are the ten rules of conduct (yama).

Ten rules of conduct called *yama* are listed in *Rāja Yoga*, but *Haṭha Yoga* does not place much emphasis on them, *Rāja Yoga* claims that *yama* and *niyama* must be practiced before commencing *Haṭha Yoga*. It says, control the mind and then purify the body, but in this day and age too many problems can arise if an aspirant comes into direct confrontation with his mind at the beginning of his spiritual quest. Therefore, in *Haṭha Yoga* the whole system has been designed for the people of *kali yuga*. *Haṭha Yoga* commences with purification of the body, the *ṣaṭkarmas*, and then comes *Āsana* and *Prāṇāyāma*. *Yama* and *Niyama* can be practiced later when the mind has become stable and its outward-going tendencies can be controlled.

Here Svatmarama is merely listing what is required from a *sādhaka* at a later stage of practice. He has mentioned the ways in which the benefits of Yoga can be enhanced and the factors that can lead to failure. The *yama* and *niyama* are given to verify why he states these causes, so there may be a little repetition on certain points. Svatmarama also advises “not to adhere to rules”. *Yama* and *niyama* are rules, and to an extent they are also moral codes. Initially, it is not essential to practice these and it should not be thought that one cannot succeed without them. The *yama* and *niyama* have been given as guidelines to keep a *sādhaka* on the path.

The first *yama* is *ahimsā*, or ‘non-violence’: to remain passive in any situation, without the desire to harm anyone or anything, either physically, emotionally, psychologically or psychically. In India, the Jain sect is very firm in this code of

conduct. They even sweep the pathway before them so they will not step on any insect and kill it. They strain all their drinking water and cut their vegetables scrupulously so that no form of life is injured. *Ahiṃsā* means not acting with the will to violate anything, even the atmosphere. Harmony and serenity have to be maintained.

There is no need to place any religious connotation on the word '*ahiṃsā*'. It is a process of self-control, self-awareness a non-involvement in everything that is around you. If you harm another person intentionally, and you lose control of your mind and actions you are creating an imbalance in yourself. Violence means moving away from your true nature; *ahiṃsā* means coming closer to the pure spirit.

'Honesty' is something we rarely find in this modern world of corruption, and it is definitely something which needs to be cultivated and instilled again. If you make a habit of fooling or cheating others, you start to believe the lies yourself. You are only being dishonest with yourself and not aiming to cheat others for your own personal gain or to discredit them.

'Non-stealing' is easy to understand: not taking what does not belong to you, not only for social or moral reasons, but to avoid psychological and kārmiṃ repercussions. Stealing breeds guilt. In Yoga we are trying to release the complexes and saṃskāras from our mind and personality, so we really do not want to create any more of them.

'Contenance', or *brahmacarya*, is the next yama. Generally *brahmacarya* is considered to be abstention from sexual involvement or relationship. Some people even go as far as having absolutely no contact with the opposite sex, neither talking nor looking at a woman or man. However, this is not the true meaning of *brahmacarya*. *Brahmacarya* is the combination of two words: *Brahman*, 'pure consciousness' and *carya*, 'one who moves'. Therefore' it means 'one who lives in constant awareness of *Brahman*'; 'one whose awareness is absorbed in pure consciousness, whose mind is above the duality of male/female, who sees the ātman in all'. One who is in constant communion with ātmā is a brahmacārī.

A true brahmacārī can be involved in sexual relationships and maintain awareness of only the supreme experience. Passions do not arise in the mind when he or she comes in contact with the opposite sex. In Yoga and tantra they explain this as maintaining the bindu, i.e. not losing the bindu or semen. The bindu has to be kept in the brain centre where it is produced. It should not flow out through the sexual organs, and if it does, it should be drawn back. For this purpose there are many Yogéc techniques which curb the production of sex hormones and restructure the reproductive organs. Yoga influences the whole endocrine system by regulating the pineal and pituitary glands.

Brahmacarya was generally taken to mean abstention from sexual activity because, by refraining from sexual stimulation, sexual impulses and the production of sex hormones are reduced. Sexual abstinence may be necessary in the beginning while one is trying to gain mastery and maintain awareness of the higher reality, sexual interaction is no barrier. In fact, in tantra it is never said that sexual interactions are detrimental to spiritual awakening. On the contrary, tantra says that the sexual act can be used to induce spiritual awakening.

By avoiding sexual contact one does not automatically become a brahmacārī. We may abstain from sexual interaction for thirty or forty years and still not be a brahmacārī. If our mind is haunted by sexual fantasies or we have an uncontrollable loss of semen even while avoiding any sort of contact, then we are definitely not a brahmacārī. We are suppressing and causing frustration, and this will do more harm than good.

Therefore, in *Haṭha Yoga* there are special techniques which aid in brahmacarya by regulating hormonal secretions and the functioning of the glands. Sexual thoughts and desires are then curbed. After all, what causes sexual motivation? A chemical reaction in the brain and body or, in the hormones. Control of the hormones induces true brahmacarya. When the bindu is retained in the brain centre, sexual urges are controlled and the mind can remain absorbed in awareness of the supreme. This is real *brahmacarya*.

The next *yama* is ‘forgiveness’, or *kṣamā*. Forgiveness actually means the ability to let experiences go from the mind and not to hold on to memories of past events. It means living in the present. This *yama* is not only for the sake of other people, it is more for one’s own benefit. If one can forgive, life becomes more pleasant and harmonious, whereas, revenge brings anger and remorse and creates negative karma. Forgiveness brings happiness and lightness one heart.

Svatmarama has discussed endurance; he called it ‘perseverance’. The trials and tribulations of life are often arduous and painful, but they have a positive purpose. If one cannot endure ordinary mundane experiences, how will one cope when the ātmā reveals itself? A spiritual experience can occur at any moment and one has to be prepared to sustain it on every level. It is not just something which happens to the spirit and leaves the body and mind unaffected.

One has to be ever alert and constant in both practice and aspiration. Even if the whole world collapses around one, it does not matter. If one gives up hope and effort, one can never be successful. The divine power is gracious to devotees and disguises itself in many forms just to test their devotion and faith. When we give up hope and belief because the odds seem to have turned against us, we have misunderstood the situation. Due to our concepts of good and bad we assume that a particular experience is negative, and react to it. However, whether circumstances seem to be pleasant or unpleasant, we must maintain faith and continue our practice; only then can *sādhana* bear fruit.

‘Compassion’ is kindness to the young and old, rich and poor, worthy and seemingly unworthy. We are all of the one ātmā. Cruelty to others ultimately rebounds on us. Kindness to others brings divine mercy. If you open your heart to the divine energy and you can feel compassion for every creature, you will make quick progress in your search for the ātmā.

Svatmarama has previously described humility as ‘modesty’. Spontaneous humility comes with divine awareness and surrender of the ego or ‘I’ awareness. It is ego which creates the feeling of separation from the ātmā and prevents us from feeling the inner being. Humbleness or meekness means simplicity of character and

lifestyle. The soul needs no lavish accessories, food or praises, and when you seek them they pull you away from your true identity.

‘Moderation in diet’ means neither overeating nor undereating. It means eating sparingly but comfortably filling the stomach and meeting the requirements of the body. Thus, body and mind remain healthy and balanced. A weak body reflects the nature of the mind. A strong and healthy body reflects the nature of the mind. Overeating and greediness for food shows an uncontrolled mind.

Your diet should be simple, pure and not over-spiced. Eat what is necessary to maintain your bodily requirements and choose a diet which will be most conducive for your *sādhana*. However, do not become too food-conscious.

The last of the yamas is cleanliness in entire lifestyle, keeping the body and mind in a pure state. When the body is clean and there are no blockages, it can become a perfect vessel for divine energy and pure consciousness. Not only should the internal body be clean, so should the surroundings in which one lives. To clean the body internally, *Haṭha Yoga* prescribes the six cleansing techniques – *neti*, *dhauti*, *nauli*, *basti*, *kapālabhāti* and *trāṭaka*.

All these ten yamas here constitute mental disciplines and self-restraints which were originally designed to help a *sādhaka* conserve and build up his store of *prāṇic* and psychic energy. Although they were formulated by exponents of *Yoga*, they can also be found in many religions. Those who had higher revelations found these disciplines helpful for preparing aspirants for spiritual experiences. However, they should not be considered as mere religious practices; they are a part of the yogic science.

In this day and age it may be difficult to try and force ourselves to keep to these rules; perhaps for this reason, Svātmaśrama does not stress their importance. However, they can be cultivated with *sādhana* and spiritual endeavour. The mind should never be forced to accept something which feels unnatural. When it comes spontaneously there will be no suppression. If we force ourselves to do something which is going against our nature, we will develop all sorts of psychological complications. So we should keep the yamas in mind and let them develop naturally.

It is true that *Svatmarama* does not give much importance in case of *yama*, yet we see in his *Haṭha Yoga Pradīpikā* some instances of dichotomy regarding *yama*. In the verse – 16(ii); chapter-I, we see *ahimsā* (non-violence) as a part of *yama*, whereas in the verse of 38 of the same chapter we see *ahimsā* (non-violence) as a part of *niyama*.

This verse says:-

यमेष्विव मितहारमहिंसां नियमेष्विव ।

मुख्यं सर्वासनेष्वेकं सिद्धाः सिद्धासनं विदुः ॥ ह. यो . प्र. १. ३८ ॥

Yameṣviva mitāhāramahimsāṁ niyameṣviva,
Mukhyaṁ sarvāsaneṣvekaṁ siddhāḥ siddhāsanaṁ viduḥ.

(HYP: 1.38)

Just as moderate diet is the most important of the yamas, and non-violence, of the niyamas, so the siddhas know that siddhāsana is the most important of the Āsanas.

Here he clearly describes that non-violence is the most important part of all *niyamas* in place of *yamas* what he says previously. So here we notice some dichotomy.

4.3. YAMA ACCORDING TO HAṬHARATNĀVALĪ

Though Srinivasa (author) described himself an exponent of *Haṭha Yoga*, he differs from his predecessors in certain respects.

His treatment of *Yama* and *Niyama* is quite individual.

GS and SSP II-32 define *Yamas*:

Upasamaḥ sarvendriyajayaḥ āhāranindra Sitavatata Pa jayas caivam śanaiḥ śanai śādhayet ie., control of indriyas, diet, sleep, cold, wind and heat are to be practiced step by step.

Success in *Yamas* is of physical nature, while that in *Niyamas* is mental or ethical.

In the third lesson, *Aṣṭāṅga Yoga*, Srinivasa enumerates a long list of sixteen yamas in the second verse. In the very first verse he tells regarding the eight limbs of *Yoga* where we get *yama* as the first limb. He writes:

अथातोष्टांगयोगानां स्वरूपं किञ्चिदुच्यते ।

बहयो योगिनः सिद्धाः अंगैरैतैश्च शोभनैः ॥ ह. रत्ना.: ३. १ ॥

Athātoṣṭāṅgayogānām svarūpaṁ kiñciducyate|

Bahayo Yogīnaḥ siddhāḥ aṅgairetaiśca śobhanaiḥ|(H. Rat. 3.1)

Now a little characteristics of eight limbs of *Yoga* are told by me. Many Yogīs have attained Siddhi by the practice of these Angas.

मनः प्रसादसंतोषो मोनमिन्द्रियनिग्रहः ।

दया दक्षिण्यमास्तिक्यमार्जवं मार्दवं क्षमा ॥

भावशुद्धिरहिंसा ब्रह्मचर्यं स्मृतिधृतिः ।

इत्येवमादयश्चान्ये मनसो नियमाः स्मृताः ॥ ह. रत्ना.: ३. २ ॥

Manāḥ prasādasantoṣo mounamindriyanigrahaḥ |

Dayā dakṣiṇyamāstikyamārjavam mārđavam kṣamā|

Bhāvaśuddhirahiṁsā ca brahmacaryam smṛtirdhṛtiḥ

Ityevamādayaścānye manaso niyamāḥ smṛtāḥ| (H. Rat.: 3.2)

Pleasure in the mind, contentment, vow to be silent, control of senses and motor organs, kindness, politeness, belief in God, straightforwardness, softness, forgiveness, purification of thoughts, non-injury, celibacy, patience, forbearance and others are known as Yama of Manas.

Here we see that he does not include the part of *truth (Satya)* in yama but in niyama.

स्नानं शौचं ऋतं सत्यं जपो होमश्च तर्पणं ।

तपो दांतिस्तितिक्षा च नमस्कार प्रदक्षिणं ॥

व्रतोपवासकाद्याश्च कायिका नियमाः स्मृताः ॥ ह. रत्ना.: ३ . ३ ॥

Snānam śaucam ṛtam satyam japo homaśca tarpaṇam ।

Tapo dāntistitikṣā ca namaskāra pradakṣiṇam

Vratopavāsakādyāśca kāyikā niyamāḥ smatāḥ (H. Rat. 3. 3.)

Bath, cleanliness, truth, utterance of Mantras, Homa, offering water to the manes, austerity, self restraint, endurance, reverential salutation, vowed observance, fasting etc., all these physical observances are called Niyama.

4.4. YAMA ACCORDING TO ŚIVA SAMHITĀ

In the Verse 4 of Chapter-I in *Śiva Samhitā* we get some description of *Yama*. Here in the division of *differences of opinion* we find:-

सत्यं केचित्प्रशंसन्ति तपः शौचं तथापरे ।

क्षमां केचित्प्रशंसन्ति तथैव सममार्जवम् ॥ शि. सं. १. ४. ॥

Ṣatyam kecitpraśamsanti tapaḥ śaucaṁ tathāpare |

Khśamām kecitpraśamsanti tathaiva samamārjavam ॥

Śiva Sam:1.4 ॥

some praise truth, others purification and asceticism; some praise forgiveness, others equality and sincerity.

Once again, in the verse 33 of the Chapter-III, in *The things to be renounced* section we find the mention of *yama* partly.

स्तेयं हिंसां जनद्वेषञ्चाहङ्कारमनार्जवम् ।

उपवासमसत्यञ्च मोक्षञ्च प्राणिपीडनम् ॥

स्त्रीसङ्गमग्निसेवा च बह्वलापं प्रियाप्रियम् ।

अतीव भोजनं योगी त्यजेदेतानि निश्चितम् ॥ शि. सं. ३. ३३ ॥

Steyam himsām janadvēṣañcāhaṅkāramanārjavam,

Upavāsamasatyañca mokṣañca prāṇipīḍanam.

Strīsaṅgamagnisevām ca bahvālāpaṁ priyāpriyam,

Atīva bhojanaṁ yogī tyajedetāni niścitam ॥ Śhiv. Sam. 3. 33 ॥

The Yogī should renounce the following :- ...10 theft, 11 killing (of animals) 12 enmity towards any person, 13 pride, 14 duplicity, and 15 crookedness; 16 fasting, 17 untruth, 18 companionship of women, 21 worship of (or handling or sitting near) fire, and 22

much talking, without regard to pleasantness or unpleasantness of speech, and lastly, 23 much eating.

4.5. YAMA ACCORDING TO YOGA SAMĀHITĀ

In Yoga Samāhitā of Swami Sivananda (author), it is written that *Yoga*, in allegiance to *Sāṅkhya*, holds that there is an eternal and omnipresent inert Prakṛti and plurality of omnipresent Conscious Puruṣa. This accepts a third principle, viz., Īśvara. The contact of the Puruṣa with the Prakṛti makes the last to evolve itself into its various effects.

Yoga concerns itself with the method of freeing the Puruṣa from this bondage through right effect. *Yoga* is, thus, more a practical way of attainment than a philosophical excursion into the realms of the spirit.

Apart from this, *Patañjali's Yoga* is generally termed the *Aṣṭāṅga Yoga* or the *Yoga of Eight Limbs*, through the practice of which Freedom is achieved. These eight limbs are: (1) *Yama* or Eternal Vows (non-violence, truth, non-stealing, continence, non-avariciousness); (2) *Niyama* or Observances; (3) *Āsana*; (4) *Prāṇāyāmā* (the regulation of the Vital Force); (5) *Pratyāhāra* (abstraction of the mind from the objects); (6) *Dhāraṇā* (concentration); (7) *Dhyāna* (meditation); and (8) *Samādhi* (superconscious state or trance).

The correspondence between this classification and the Eight Limbs is clear. *Yama* and *Niyama* purify the individual's actions and make them more *Sāttvic*. *Tāmasic* and *Rājasic* which are the pillars of Samsāra are pulled down through the practice of the Ten Canons. Inner purity is increased. The individual's nature itself is made *Sāttvic*.

Thus, *Yama-Niyama* pave the way. *Āsanas* and *Prāṇāyāma* enable the individual to realize the truth about life. *Pratyāhāra* and *Dhāraṇā* take the Sādhaka beyond *Rāga-Dveṣa*. *Dhyāna* dissolves the ego or *Asmitā*; Finally, in *Nirvikalpa Samādhi*, the veil of ignorance is torn and the individual is liberated.

4.6. YAMA ACCORDING TO SOME UPANIṢADS

4.6.1 IN TEJOBINDŪPANIṢAT:

In *Tejobindūpaniṣat* it is seen that the anonymous composer of this work puts light on *yama*. This *Upaniṣat* has six chapters with total of 465 verses. It is extracted from *Kṛṣṇayajurveda*.

The following verse of this *Upaniṣat* contains the reference of Yama:

यमो हि निमस्तयागी मैत्रं देशश्च कालतः ।

आसनं मूलबन्धश्च देहसाम्यं च किस्थितिः ॥ १५ ॥

Yamo hi nimastayāgī mainam deśaśca kālataḥ|

Asanam mūlabandhaśca dehasāmyam ca kisthatiḥ||15||

प्राणसंयमनं चैव प्रत्याहारश्च धारणा ।

आत्मध्यानं समाधिश्च प्रोक्तानङ्गानि वै क्रमात् ॥ १६ ॥

Prāṇasaṅnyamanam caiva pratyāhāraśca dhāraṇā|

Ātmādhyānam samādhiśca proktāṅgāni vai kramāt||16||

Yama, Niyama, Tyāga, Mauna, Deśa, Kāla, Āsana, Mūlabandha, Dehasamyam, Dṛṣṭisaṅnyama, Prāṇasaṅnyamanam, Pratyāhāra, Dhāraṇā, Ātmādhyāna, Samādhi are the *Pañcadaśāṅgas* of Yoga.

There are 15 limbs according to this *Upaniṣat* which is popularly known as *Pañcadaśāṅga Yoga*, where *Yama* is mentioned as the first limb as in the *Aṣṭāṅga Yoga* described by *Patañjali* .

4.6.2 IN TRISIKHIBRĀHMANOPANIṢAT:

This *Upaniṣat* has been extracted from *SuklaYajurveda*. In the 28th verse there is the mention of *Yama* among one of the limbs of *Aṣṭāṅga Yoga* in this *Upaniṣat*.

देहेन्द्रियेषु वैराग्यं यम इत्युच्यते बुधैः ।

अनुरक्तिः परे तत्त्वे सततं नियमः स्मृतः ॥ २८ ॥

Dehendriyeṣu vairāgyam yama ityucyate budhaiḥ |
Anuraktiḥ pare tattve satatam niyamaḥ smṛtaḥ ||28||

This *Upaniṣat* interprets strict attention to the observances laid down in the scriptures, which presumably means the works of *Haṭha Yoga*. In this context, it recommends holistic approach of *Aṣṭāṅga Yoga* for purification as well as attainment of real knowledge.

4.6.3 IN DARŚANOPANIṢAT :

This *Upaniṣat* has been extracted from *Sāmaveda*. It also presents itself as the teaching given by Lord *Dattātreya* to the sage *Samkṛti*. It defines all the limbs and speaks of ten moral disciplines and self-restraints rather than the five introduced by *Patañjali* though the following verses have elaborately discussed about the *Aṣṭāṅga Yoga* in the same manner as *Patañjali* .

सांकृते शृणु वक्ष्यामि योगं साष्टाङ्गदर्शनम् ।

यमश्च नियमश्चैव तथैवासनमेव च । ४ ।

Sāṅkrte śṛṇu vakṣyāmi Yogam sāṣṭāṅgadarśanam |
Yamaśca niyamaścaiva tathaivāsanameva ca |4|

प्राणायामस्तथा ब्रह्मन् प्रत्याहारस्ततः परम् ।

धारणा च तथा ध्यानं समाधिश्चाष्टमं मुने ॥५॥

*Prāṇāyāmastathā brahman pratyāhārastataḥ param |
Dhāraṇā ca tathā dhyānaṁ samādhiścāṣṭamaṁ mune ||5||*

This *Upaniṣat* also mentions regarding *Yama* as one of eight limbs as like as *Patañjali 's Aṣṭāṅga Yoga*.

4.6.4 IN YOGATATTVOPANIṢAT:

This is another *Upaniṣat* which is derived from *KṛṣṇaYajurveda* also contains the aspect of *Yama*. Here *Hṛṣīkeśaḥ* as a part of imparting knowledge of *Brahmatattva* makes the reference of *Aṣṭāṅga Yoga* to *Brahma* in the form of the following verses where we find the mention of *Yama*.

यमश्च नियमश्चैव ह्यासनं प्राणसंयमः ॥ २४ ॥

Yamaśca niyamaścaiva hyāsanam prāṇasaṁyamah ||24||

It is to be noted that this *Upaniṣat* also has the reference of *Yama* as the first limb like *Aṣṭāṅga Yoga* of *Patañjali*.

4.6.5 IN VARĀHOPANIṢAT:

This *Upaniṣat* has also been extracted from *KṛṣṇaYajurveda*. It is yet another one with all the 8 limbs of *Aṣṭāṅga Yoga* with the concept of *Yama*.

यमश्च नियमश्चैव तथा चासनमेव च ।

प्राणायामस्तथा पश्चात् प्रत्याहारस्तथा परम् ॥ ११ ॥

धारणा च तथा ध्यानं समाधिश्चाष्टमी भवेत् ।

*Yamaśca niyamaścaiva tathā cāsanameva ca |
Prāṇāyāmastathā paścāt pratyāhārastathā param ||11||
Dhāraṇā ca tathā dhyānaṁ samādhiścāṣṭamī bhavet |*

Yama, Niyama, Āsana, Prāṇāyāma, Pratyāhāra, Dhāraṇā, Dhyāna, Samādhi are the eight aṅgas of *Yoga* where *Yama* is the premier principal to follow.

4.6.6 IN ŚĀNDILYOPANIṢAT:

The above *Upaniṣat* has been extracted from *Atharvanaveda*. It deals much with the Haṭha Yoga concepts and techniques, but also insists on the self-knowledge and Yogic practice.

Śāṅḍilya, in order to know about *Aṣṭāṅga Yoga*, seeking in realizing self, asks *Maharṣi Atharvana* to let him know about the topic. In answer to above, *Atharvana* says:

स होवाचाथर्वा

यमनियमासनप्राणायामप्रत्याहारधारणाध्यानसमाधयोऽष्टाङ्गानि ॥ २ ॥

Sa hovācātharvā

Yamaniyamāsanapraṇāyāmapratyāhāradhāraṇādhyānasamādhayo'astāṅgāni

So, it is really amazing to know that most of the *Yogopaniṣads* containing either all or more or less limbs of *Aṣṭāṅga Yoga* which gives the indication of Holistic approach, where we always find the part of *Yama*.

4.7. YAMA ACCORDING TO THE COMMENTARY OF VYĀSA

In '*Yogasūtra Of Patañjali with The Commentary Of Vyāsa*' of Bangali Baba (writer) we notice:

तत्राहिंसासत्यास्तेयब्रह्मचर्यापरिग्रहा यमाः ॥२। ३० ॥

Tatrāhimsāsatyāsteyabrahmacaryāparigrahā yamāḥ ॥2. 30 ॥

There Harmlessness, Truthfulness, Abstinence from theft, Continence and Non-Acceptance of gift are the Restraints. [30 of chap-II.]

तत्राहिंसासत्यास्तेयब्रह्मचर्यापरिग्रहा यमाः । तत्राहिंसा सर्वथा सर्वदा सर्वभूतानामनमिद्रोहः । उत्तरे च यमनियमास्तन्मुलास्तत्सिद्धिपरतयैव तत्प्रतिपादनाय प्रतिपाद्यन्ते । तदवदातरुपकरणायैवोपादोयन्ते । तथा चोक्तम् - स खल्वयं ब्राह्मणो यथा यथा व्रतानि बहुनि समादित्सते तथा तथा प्रमादकृतेभ्यो हिंसानिदानेभ्यो निवर्तमानस्तामेवावदातरुपामहिंसां करोति ।

Tatrāhimsāsatyāsteyabrahmacaryāparigrahā yamāḥ | tatrāhimsā sarvatha sarvadā sarvabhūtānāmanamidrohaḥ | uttare ca yamaniyamāstanmulāstasiddhiparatayaiva tatpratipādanāya pratipādyante | tadavadātarupakaraṇāyaivopādoyante | tathā cokatam - sa khalvayam brāhmaṇo yathā yathā vratāni bahuni samāditsate tathā tathā pramādaḥkṛtebhyo himsānidānebhyo nivartamānstāmevadbātrupāmahimsām karoti |

There, harmlessness is the absence of oppression towards all living beings by all means and for all times. The following Restraints and Observances are its root. Their main object is but its attainment; they are accomplished for its achievement; they are taken up for making it perfect. So also it has been said:- He is indeed a Brāhmaṇa who, – the more he wishes to accept many a vow, the more he turns away from the origins of injury caused through inadvertence,– simply makes that harmlessness perfect.

सत्यं यथार्थे वाङ्मनसे । यथा दृष्टं यथानुमितं यथा श्रुतं तथा वाङ्मनश्चेति । परत्र स्वबोधसङ्घान्त्रान्तये वागुक्ता सा यदि न वञ्चिता भ्रान्ता वा प्रतिपत्तिवन्ध्या वा भवेदित्येषा सर्वभूतोपकारार्थं प्रवृत्ता न भूतोपघाताय ।

Satyam yathārthe vāṅmanase | yathā dṛṣṭam yathānumitam yathā śrutam tatha vāṅmanasacetī | paratra svabodhasaṅghāntṛāntaye vāguktā sā yadi na vañcitā bhrāntā vā pratipattivandhyā vā bhavedityeṣā sarvabhūtopakāārārtha pravṛttā na bhutopadhātāya |

Truthfulness consists in true speech and mind, i.e., the speech and mind in accordance with that which is seen, inferred and heard. The speech is uttered for transferring one's own knowledge to another, if it is neither deceptive nor mistaken nor barren of observation and if it is engaged for the good of all living beings but not for their injury (that speech is truthful).

यदि चैवमप्यभिधोयमाना भुतोपधात्पव स्यात्र सत्यं भवेत् पापमेव भवेत् । तेन पुण्याभासेन पुण्यप्रतिरूपकेण कष्टं तमह् प्रापनुयात् । तस्मात्परोक्ष्य सर्वभूतहितं सत्यं ब्रूयात् ।

Yadi caivamapyabhidhoyamānā bhutopdhātpava syātra satyaṁ bhavet pāpameva bhavet | tena puṇyābhūsenā puṇyapratirupakeṇa kaṣṭaṁ tamah prāpanuyāt | tasmātparokya sarvabhūtahitaṁ satyaṁ brūyāt |

But in spite of being used with the best of intentions, if it turns to be the injury to living beings, it cannot be truthful; it must be but sin; the advocate of such Truth must go to painful darkness by that false show and false appearance of virtue. Therefore, after examining it carefully, one should speak the truth beneficial to all beings.

स्तेयमशास्त्रपूर्वकं द्रव्याणां परतः स्वोकरणं तत्प्रतिषेधः
पुनरस्पृहारूपमस्तेयमिति ।

Steyamaśāstrapūrvakaṁ dravyāṅāṁ parataḥ svokaraṇaṁ tatpratiṣedhaḥ punarasprhārūpamasteyamiti |

Theft is the acceptance of things from another against the laws of the Scriptures. Abstinence from theft consists in the negation thereof, as also in the absence of the desire for it.

ब्रह्मचर्यं गुप्तेन्द्रियस्योपस्थस्य संयमः ।

Brahmacarya guptendriyasyopasthasya saṁyamaḥ |

Continence is the full control of the sex-organ, the organ of generation.

विषयाणामर्जनरक्षणक्षयसहिंसादोषदशैनादस्वोकरणमपरिग्रह इत्येते यमाः ।

Viṣayāṅāmarjanarakṣaṇakṣayasahirṁsādoṣadaśainādasvokaraṇamaparigraha ityete yamāḥ |

Non-acceptance of gifts is the non-receiving of things after realising the blemishes of material goods in earning, preservation, loss, attachment and injury. These are the Restraints.

Here the commentator extols the non-acceptance of gifts from others and deprecates the hoarding up of wealth, because it brings about the downfall of the Yogī; and this statement is confirmed by all our scriptures.

4.8. YAMA ACCORDING BRHADYOGĪYĀJÑAVALKYASMṚTIḤ

It is be found that the text of *BṛhadYogīyājñavalkyasmṛtiḥ* contains an importnt and useful clarification, related to *Yoga*. The approach of this text towards *Yoga* represents what may be called *Smārta Yoga*, which has a leaning towards the rituals as prescribed in the *Smṛiti* literature.

Though it is true that regarding yamas this text shows not a lot of importance yet is has a signaficant contribution in the history and develoment of *Yoga*.

In the thirty-two and thirty-three verses of the chapter VII it is seen:

VII.32-33. The God *Nārāyaṇa*, who is the enjoyer of the religious vows, mortification, *Yamas*, Niyamas, and sacrificial rites and who is meditated upon by

Yogīs, should be remembered at the time of the rites of bathing as well as expiation. By this, one is relieved of all the misdeeds.

159.VII. The non-injury, truth, non-stealing, purity, control of the sense organs, self-control, tranquility, sincerity and gift are the essential acts of religion for all. One having seized the vow in the form of ***Yamas* (selfrestraint)** and a firmly stretched bow-string in the form of ***Niyamas* (observances)**, one should aim at the ***Svarga*** with an arrow in the form of ***Dama*** (self-control) with effort.

IX.35-36. Owing to the practice of eight steps of *Yoga*, namely, *Yamas*, *Niyamas*, *Āsanas*, *Prāṇāyāmas*, *Pratyāhāra*, *Dhyāna*, *Dhāraṇā* and *Samādhi*, one attains liberation as well as obtains siddhis like ***Aṇimā*** etc.

CHAPTER – 5

DIFFERENCES IN CONCEPTS AND HOLISTIC ASPECT OF YAMA

A number of differences are shown in *Yama*. In *Rāja-Yoga* we find five types of *yama*. They are *Ahiṃsā*, *Satya*, *Asteya*, *Brahmacarya* and *Aparigraha*. According to *Haṭha Yoga* they are ten in number or ten rules of conducts. They are *Non-violence*, *truth*, *non-stealing*, *continence (being absorbed in a pure state of consciousness)*, *forgiveness*, *endurance*, *compassion*, *humility*, *moderate diet and cleanliness*. In *Haṭharatnāvalī* we find a long list of sixteen *yamas*. They are

pleasure in the mind, contentment, vow to be silent, control of senses and motororgans, kindness, politeness, belief in God, straightforwardness, softness, forgiveness, purification of thoughts, non-injury, celibacy, patience, forbearance and others. In *Śiva Saṁhitā*, it is said that the yogi should renounce *theft, killing (of animals), enmity towards any person, pride, duplicity, crookedness; fasting, untruth, companionship of women, worship of (or handling or sitting near) fire, much talking, without regard to pleasantness or unpleasantness of speech, and lastly, much eating* – all come under yama.

Thus a variety of concept of yama is seen in various yogic texts but all try to direct us mainly towards Self Restraint.

In the discussion of holistic concept of yama, we see that *Patañjali* goes on to analyze the causes of the disturbances of the mind and the lack of equilibrium in the body. *Yama* helps to come out of these obstacles. In all the other yogic texts we find almost the same view.

Thus, by the regular practice of Yama at the outset, an individual gets ethical or moral training. Thus, cultivation of love for all, and seeing the same *Ātmān* within everybody by the proper practice of *Ahiṁsā*; by the practice of *Satya* we must be careful not to hurt anybody. When the real feelings and the spoken words would be same, then true spirituality occurs. By maintaining *Asteya* we must not harbour any feelings of covetousness, either toward persons or objects. Taking more than we need, and wasting it is a form of stealing from the rest of mankind. From this, a perfect kind of duty of service to mankind will come. Through *Brahmacarya*, chastity in word, thought and deed will happen. With the idea of free from sex would lead to achieve purity of heart which is nothing but one step further for an all-round development of body, mind and soul. As one continues the practice of *Aparigraha*, freedom from attachment will occur, which results in knowledge of the whole course of human journey. Thus, through the practice of different parts of Yama, the individual develops understanding of his own self. He proceeds step by step from the known – his body – to the unknown – the self. He proceeds from the outer envelope of the

body – the skin – to the mind, from the mind towards the subtler aspects, and lastly to the self.

Thus, holistic approach of *Aṣṭāṅga Yoga* specially codes of conduct like *Yama* may provide light on many areas like reason for decisiveness, reason for stress and how to improve quality of life and be happy at all the time.

CHAPTER - 6

USEFULNESS AND RELEVANCE

In this modern age of machine and power, human being has a lot of control over machines but no control of himself. In this critical juncture, a discipline like *Yama* may revive society and lead it to a new fruitful direction.

In the modern context, *Yama* is 'discipline'. Discipline is being methodical. We can present in various levels in our daily life. At the physical level, at the emotional level, at the moral level and at the spiritual level. And each level has further elaboration.

At the Physical level we can put three things. Physical culture consisting of the day's routine like exercises, diet, habits, hobbies etc. Here it is necessary to ensure how systematically the twenty-four hours are distributed.

At the Emotional level, we channelize the emotions, control the emotions and we kill the emotions. Then *kāma*, *krodhaḥ*, *lobha*, *mohaḥ*, *mada* and *mātsarya* can be controlled.

At the Mental level we should not cause disharmony in the society. By this, we get honesty, integrity, truthfulness etc.

At the Intellectual level, self-examination, analysis and rationalism occur. Then every movement comes under control.

At the Spiritual level, silence, meditation etc. are observed.

So at present, society needs to maintain *Yamas* for a strong, wealthy and healthy structure which leads it towards the goal of peace.

It may be said that the most important feature which distinguishes the present era from all the preceding eras is that; in this Age, there is tension all over in the atmosphere. The great hubhub in the ever-growing cities, the noise because of motor vehicles, factories and jostling crowds in the busy market place – all these affect badly on man's nerves and cause him irritation. Never before were the cities so big, vehicles and factories so many or noise – pollution so high as today.

In these modern times, man has more requirements, his life has become more mechanical, he is in greater hurry and his worries have alarmingly increased. More mechanical, more towards material world and less of real happiness. As such, man, today, is placed in a situation of constant stress and strain. He takes most of the decisions in this state of tension and hurry and, thus, gets himself into further trouble.

This is as true of nations as of individuals. More than this, the sedentary lifestyle leads them always towards restlessness and more tensioned lives. They get stuck in various psycho-somatic as well as psychic disorders.

In such a volcanic situation, maintenance of even a portion of moral disciplines or observances like *Ahimsā*, *Satya* etc. can indeed pacify the mind. And when mind gets some sort of controlling capacity, an individual may take proper decision on problems which lead would otherwise to stress. Even in trouble she/he will be calm and cool. Thus the balance in parasympathetic and sympathetic nervous system.

Not to harm anybody but love others (Ahimsā). It should be maintained from childhood of our lives which may bring a vast change in the society. We should go into the very base of the society: in all the family some moral code of observance like *not to borrowing more from the world than we absolutely need, and make full and proper use of it (asteya)*.

Abstention from greed (aparigraha) can also keep us from unwanted needs in life. We can be restrained with our demand and no tension will occur. When extra demand goes down, then less tension, more peace takes place. That really may happen by the application of principles of yama.

The word 'holistic' in today's life is going to be fashionable, and often hears people speak of holistic approach. The word 'holistic' contains the word 'whole', which is the true meaning of 'healthy'. When there is wholeness of body, mind and self, this wholeness becomes holy. Holy means divine, and without divinity one can not truly speak of holistic practice.

When a person connects the soul to the skin and the skin to the soul, when there is a tremendous communion between the cells of the body and the cells of the soul, then that is holistic or integrated practice, because the whole of the human system has been integrated into a single unit in which body, mind, intelligence, consciousness and soul come together.

Though miraculous advances in science and technology have been made in the past four centuries, no one can define a frontier between body and mind or between mind and soul. They can not be separated. They are intermingled,

interconnected, united. Where there is mind, there is body; where there is body, there is mind, there is soul. Yet our everyday experience is of a feelings of great separation among these three. When we are engaged in mental activity, we are no longer aware of the body. When we are involved with the body, we lose sight of the soul.

Yama as a limb of *Aṣṭāṅga Yoga* also as the other limbs is a way to move towards integration, but where does our initial state of disintegration come from? It comes from the afflictions of life: lack of knowledge, lack of understanding, arrogance, attachment, hatred, malice, jealousy. These are the causes which afflict us and bring physical, mental, emotional and spiritual problems. And how can do we overcome these? By the practice of the principles of yama.

CHAPTER – 7

SUMMARY AND CONCLUSION

Patañjali goes on to analyze the causes of the disturbances of the mind and the lack of equilibrium in the body. All the eight limbs of *Aṣṭāṅga Yoga* like *Yama*, specially helps to overcome the obstacles.

At the national level if India is to revive its cultural heritage all its people must be very faithful and ardent in the observance of *Yama*. These are the basic disciplines for National Growth. Our country, at present, needs, honesty/ discipline. Thus *Yama* should be implied in the family life, in the student life, in the institutions, in the all political fora and basically for each individual.

It is best to note again that the *Yamas* are a set of DON'TS whereas *Niyamas* are a set of DOS. *Yama* can and, therefore, must be practiced at all stages of *Yoga*; whereas the last being positive are attainable only by the distinct growth of mind through *Yoga*. The virtues of non-injury, truthfulness, sex-restraint, etc. should be adhered to at all stages of the *Yoga* practice. They are indispensable for steadying the mind.

It is said that, in the presence of a person who has acquired steadiness in *ahimsā* all beings give up their habits of enmity; when a person becomes steady in truthfulness, whatever he says becomes fulfilled. When a person becomes steady in *Asteya* or absence of theft, all jewels from different quarters become his. Continence being confirmed, vigour is obtained. Non-covetousness being confirmed, the knowledge of the causes of births is attained. By the steadiness of cleanliness, disinclination to this body and cessation of contact with others are obtained.

Thus this study tries to give a bird's eye view of the vast sea of the principles under *Yama*.

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ABSTRACT

With the popularity of yoga, measurements of metabolic changes in different yogic postures are being taken up by scientific community. Energy expenditure during various exercises and *āsana*s are common now. Studies on energy expenditure during the practice of standing balancing postures are rare. The aim of this study was to examine the metabolic changes during a standing balancing yoga posture *vṛkṣāsana* (VRK) (firm tree stand) as compared to supine rest (SR). In this self as control study the Subjects were 33 healthy (16 males and 17 females) volunteers between 20-35 years of age with more than three months experience in the practice of *āsana*s. Breath by breath recording of oxygen consumption (VO_2), carbon dioxide elimination (VCO_2), energy expenditure (EE), minute ventilation (VE), respiratory exchange ratio (RER), respiratory rate (RR) and heart rate (HR) were carried out using computerized Oxycon Pro system for the entire period of 17 minutes. The sessions were divided into 4 phases (i) pre (5 min), (ii) during (2 min), (iii) recovery (5 min) and (iv) post recovery (5 min). The three sessions [Vṛkṣāsana on Right Leg (VRK-RL), Vṛkṣāsana on Left Leg (VRK-LL) & Supine Rest (SR)] were one day apart. VRK is a standing balancing posture in which the trunk is maintained vertically to ground on left or right leg placing the foot of one leg at the root of the other standing thigh and both palms joining straight over the head by the side of ears. During the control session (SR) the subject lies down in a supine position throughout the practice. During the practice of VRK-RL and VRK-LL, the male mean values of VO_2 and EE significantly increased 84.49%, 87.25% and 87.75%, 89.93% respectively compared to pre values. During the practice of VRK-RL and VRK-LL, the female mean values

of VO₂ and EE significantly increased 59.15%, 60.18% and 63.58%, 64.75% respectively compared to pre values and post values of VO₂ and EE of VRK-RL and VRK-LL were significantly reduced by 5.48%, 6.00% and 5.05%, 5.24% respectively compared to pre values. During the practice of VRK-RL and VRK-LL, the male mean values of RR and HR significantly increased 40.22%, 43.33% and 33.53%, 41.88% respectively compared to pre values. During the practice of VRK-RL and VRK-LL, the female mean values of RR and HR significantly increased 28.68%, 37.88% and 24.88%, 38.34% respectively compared to pre values. In the SR session the male and female mean values of VO₂ and EE reduced continuously in all phases. During the practice of VRK-RL, the whole group mean values of VO₂ and EE increased by 72.64% and 74.63% followed by 4.12% and 4.28% reduction in post phase respectively compared to pre values. During the practice of VRK-LL, the group mean values of VO₂ and EE increased by 76.58% and 78.32% followed by 3.93% and 4.05% reduction in post phase respectively compared to pre values. These values in the control session of supine rest showed continuous reduction. RR & HR also increased significantly during VRK-RL and VRK-LL but not in SR. It can be concluded that *Yogāsana*s though practiced with relaxation, may increase muscular effort mainly during the practice. Therefore these yogic postures can be used as an aerobic exercises followed by deep rest.

Key Words:

Vṛkṣāsana, standing balancing posture, oxygen consumption, respiratory rate, heart rate, energy expenditure.

CHAPTER - 1

INTRODUCTION

The body gets all the necessary strength to deal with the situation. This stamina through the harnessing of inner vital energies and training the different organs and systems to work in such co-ordination can be effectively accomplished by yogic practice. It is in this area of application of yoga that the specialists in physical culture, wrestlers, sportsmen, acrobats, gymnasts, etc., are keenly interested and wherein they are using yoga to its utmost (Nagendra, 2000).

Yoga is an ancient Indian science and way of life which includes the practice of specific postures, regulated breathing and meditation (Taimni, 1961). By practicing yoga, one's response to external stimuli becomes moderate in intensity. This is because the practice of yoga induces a mental state of tranquility and equanimity. All yoga practices bring about physiological and mental balance through deep relaxation. Āsanas are various kinds of postural exercises mentioned in various yogic texts and being practiced in India since a long back. It is showed that, practice of *Sarvangāsana* for two weeks produced resting bradycardia and a decreased Left ventricular End – Diastolic Volume (LVEDVI)(Debbindu, 2000). There was a 68.6% increase in oxygen consumption during the head stand (*Sirshāsana*) as reported in six subjects (Rao, 1962). Mild increase in oxygen consumption 1790 ml/min during a sitting meditative posture *Siddhāsana* has also been established (Rai et al., 1994). Oxygen consumption was increased by 570 ml/min. after the standing posture *Vīrāsana* (Rai et al., 1994). Systematic study of continuous recording of metabolic variables before, during, & after *Ardhakati Cakrāsana* from right side showed a rise of 32% during the 3 minute practice followed by reduction by 7% in post recovery period (Singh NG, 2003). In the same way, *Ardhakati Cakrāsana* from left side had shown a rise of 31.61% increase during 3 min practice followed by reduction of 9.6% in post recovery phase (Phurailatpam S S, 2003). Study on *Viparītakaraṇi* also showed that

during the practice, oxygen consumption and energy expenditure increased by 84% and 86% followed by 7%, 8% reduction in post phase respectively (Ramana R, 2004).

Scientific community has been studying the physiological effect of these yoga practices during last 30-40 years. To understand the energy expenditure during various types of exercises and asanas is gaining importance. No scientific studies have been reported on metabolic changes during the practices of standing balancing postures like *Vṛkṣāsana*. Hence the present study was designed to measure some metabolic and cardio respiratory changes of a standing balancing posture called *Vṛkṣāsana*.

CHAPTER: 2

AIM OF THE STUDY

The present study is aimed to investigate the respiratory and metabolic changes ‘during’ and ‘after’ the practice of *Vṛkṣāsana* [*Vṛkṣāsana* on Right Leg (VRK-RL) and *Vṛkṣāsana* on Left Leg (VRK-LL)], a yogic standing balancing posture.

CHAPTER: 3

LITERATURE REVIEW

3.1 Literature review on *Āsana*

1. “Metabolic cost of head-stand posture” indirectly assessed Oxygen consumption. Six healthy male medical students between the age group of 19 and 22 years were the subjects for the observation. The study showed that there was a 68.6% increase in oxygen consumption during the head stand (*Sirshāsana*) posture (Rao S,1962)
2. Rai L, Ram K (1993) on their study “Energy expenditure and ventilatory response during *Virāsana* – a yogic standing posture” on 10 healthy men (25-37 years of age) observed higher oxygen consumption (169%) in during, and lesser ventilatory equivalent. The observation suggests that *Virāsana* induces temporarily a hyper metabolic rate characterized by enhanced sympathetic nervous system activity (Rai L& Ram K, 1993).
3. Rai L, Ram K (1994) in another paper “Energy expenditure and ventilatory response during *Siddhāsana* – a yogic seated posture” observed various cardio ventilatory responses and found out that the posture was characterized by greater minute ventilation, larger tidal volume higher oxygen consumption, greater carbon dioxide elimination, higher heart frequency. The observation suggested *Siddhāsana* – as a mild type of exercise (Rai L& Ram K. 1994).

4. Debbindu Konar, & R. Latha (2000) in their study, ``Cardiovascular Responses to Head – Down – Body up Postural Exercise (*Sarvāṅgāsana*) `` showed that a practice of this postural exercise for two weeks produces resting bradycardia and a decrease Left ventricular End – Diastolic Volume (LVEDVI) (Debbindu K, Latha R, and Bhuvaneshwaran S, 2000).

5. Sinha B, Ray US et al. (2004) in their study titled “Energy Cost and Cardio respiratory Changes during the practice of *Surya Namaskār*” assessed during the Pulmonary Ventilation, Carbon dioxide out put, Oxygen Consumption, HR and other cardio respiratory parameters. Oxygen consumption was highest in the eighth posture and lowest in the first posture. Total energy cost throughout the practice of *Surya Namaskār* was 13.91 kcal and at an average of 3.79 kcal/min. During its practice highest HR was 101 ± 13.5 b/min. They concluded that as an aerobic exercise *Surya Namaskār* seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardio respiratory system (Sinha B & Ray U S, 2004).

3.1.1 Studies at sVYASA on Āsana:

1. Manjunath NK and Telles S. in their paper “Effect of head stand (*Sirsāsana*) practice on autonomic and respiratory variables” observed that both types of *Sirsāsanas* (without support and with support) had an increase in the power of the low frequency component (LF) and a decrease in the height frequency component (HF) of the heart rate variability (HRV) spectrum, increased LF/HF ratio, and decreased heart rate. These changes support the view of sympathetic activation (NK Manjunath and Shirley Telles, 2003).

2. Pradhan Balaram, Chaya P, Nagarathna R and Nagendra H.R.(2003) in their study ``Energy Expenditure During *Padahastāsana* – A Yogic Standing Forward Bending Posture`` showed comparison with a control session of Tread Mill walk at a speed of 3 km/hrs. During *Padahastāsana* there was significantly increased in energy expenditure (EE) compared to pre values. EE reduced in the recovery and post

sessions. They concluded that *Padahastāsana* produces a milder metabolic stimulation as compared to walking for the same degree of vasomotor activation (Pradhan Balam, Chaya P, Nagarathna R and Nagendra H.R.2003).

3. Ningombam Ganga Singh, (2003) in his study “Metabolic changes during *Ardhakati cakrāsana* from Right side” compared the energy expenditure (EE) during the practice of AKC right side. The EE significantly increased compared to pre values and reduced in the recovery and post sessions.

[Ningombam Ganga Singh, (2003) Metabolic changes during *Ardhakati cakrāsana* from Right side”. Research Dissertation. Hindu University of America, Prashanti Kutiram (Extension Center), Vivekananda Yoga Anusandhana Samsthana, Bangalore, India]

4. Sanhal sharma Phurailatpam, (2003) in his study “Metabolic changes during *Ardhakati cakrāsana* from Left side” observed. This was compared with a control session of Tread Mill walk at a speed of 3 km/hrs. The energy expenditure (EE) during the investigations significantly increased compared to pre values and reduced in the recovery and post sessions.

[Sanhal sharma Phurailatpam, (2003) Metabolic changes during *Ardhakati cakrāsana* from Left side”. Research Dissertation. Hindu University of America, Prashantkutiram(Extension Center), Vivekananda Yoga Anusandhana Samsthana, Bangalore, India]

5. Venkatramana G (2004) observed, that during *Viparītakaraṇi* the oxygen consumption and energy expenditure increased by 84%, 86% followed by 7%, 8% reduction in ‘post’ phase respectively. The control session of supine rest showed continuous reduction in these variables. Respiratory rate and heart rate increased significantly during *Viparītakaraṇi* and not in supine rest. The changes were more prominent in females than males.

[Ramana Venkat G (2004), Energy Expenditure during *Viparītakaraṇi* - A yogic Inverted posture, Research Dissertation submitted to Vivekananda Yoga Anusandhana Samsthana, Bangalore, India]

6. Gourav C (2005) recently observed that during *Vajrāsana* no significant metabolic and respiratory stimulation occurs and may bring about a mild sympathetic arousal akin to meditation itself. There was a non-significant increase in RER, BF, and Minute Ventilation during *Vajrāsana*, which reduced after the practice, whereas these measures showed a significant reduction during SR.

[Chandratre G (2005), Energy Expenditure during *Vajrāsana* A yogic Sitting Meditative Posture, Research Dissertation submitted to Vivekananda Yoga Anusandhana Samsthana, Bangalore, India.]

3.2 Literature review on *Śavāsana* or resting postures

1. Bera TK, Gore MM & Oak JP (1998) in their paper on “Recovery from stress in two different postures and in *śavāsana* – a yogic relaxation posture” observed that recovery from induced physiological stress in *śavāsana* (a yogic relaxation posture) and to other postures (resting in chair and resting supine posture). Twenty one males and 6 females (age 21-30) were allowed to take rest in one of the above postures immediately after completing the scheduled treadmill running. The recovery was assessed in terms of Heart Rate (HR) and Blood Pressure (BP) HR, BP was measured before and every two minutes after the treadmill running till they returned to the initial level. The results revealed that the effects of stress were reversed in significantly ($P < 0.01$) shorter time in *śavāsana*, compared to the resting posture in chair and a supine posture (Bera TK, Gore MM & Oak JP 1988).

2. Vemapati R P and Telles (1999) in their study titled “Yoga based isometric contraction versus supine rest: A study of oxygen consumption, breath rate and breathe volume and autonomic measures” assessed the autonomic parameters on 15 subjects, before and after their practice, whereas oxygen consumption, breath rate and breathe volume were recorded in 25 subjects, before and after Yoga based isometric relaxation (IRT) and supine rest (SH). Significant decreases in breath rate after IRT and in finger Plethysmogram were recorded after SH (Vemapati R P and Shirley telles, 1999).

3. Telles S, Satish K R and Nagendra H R (2000) studied “Oxygen consumption and respiration following two yoga relaxation techniques”, of 40 male volunteers before and after session of cyclic meditation (CM) and before and after session of *śavāsana* (SH). There was significant decrease in the oxygen consumed, breath rate and an increase in breath volume after both types of sessions (two factor ANOVA, paired t test). However, magnitude of change on all three measures was greater after *Cyclic Meditation*. First, oxygen consumption decreased 32.1% after CM compared 10.1% after SH. Secondly, breath rate decrease 18.0% after CM and 15.2% after SH; and thirdly, breath volume increase 28.8% after CM and 15.9% after SH (Telles S, Satish K R and Nagendra H R, 2000).

CHAPTER: 4

METHODS

4.1 SUBJECTS:

Thirty three healthy volunteers (male 16, female 17) with age range from 20 to 35 years participated in the study. They all had more than three months of experience in practicing of asanas. Also all of them underwent two weeks supervised practice of maintaining in posture *Vṛkṣāsana* for two minutes. They had a mean weight of 54.24 SD \pm 9.06kgs, a mean height of 161.64 SD \pm 9.33 Cms and body mass index (BMI) of 20.66 SD \pm 1.84 Kg/m².

4.1a Source of the Subject: The subjects were the residential students at a Yoga University, (Swami Vivekananda Yoga Research Foundation, Bangalore) and had lived in the campus for more than three months. They all had the same diet, did the same activities, had the same daily routine, sleeping hours etc.

4.1b Inclusion criteria: (i) Healthy male and female volunteers between the ages of 20-35 years, (ii) residing as yoga students more than three months in the campus, and (iii) having two weeks experience in supervised practice of maintaining Vākñāsana posture were included in the study.

4.1c Exclusion criteria: The following criteria were used to screen the volunteers: (i) the presence of metabolic disorders based on a medical history and routine clinical examination (ii) in take of medication, which is known to influence autonomic and metabolic functions (iii) smoking or alcoholism which may have influenced the respiratory and metabolic variables and (iv) the subjects whose body mass index was less than 18 or more than 25 were excluded.

4.1d. Informed consent: The aim and methods of the study was explained to the subjects and the signed informed consent was obtained from all the subjects, who participated in the study.

4.2 STUDY DESIGN

This was a self as control design. All the thirty subjects were assessed before, during and after experimental and control sessions.

- Intervention session: *Vṛkṣāsana*; a balancing standing posture (VRK) on both legs separately.
- Control session: Supine Rest (SR).

The measurements were carried out in these three sessions on alternate days in alternating order for all the subjects.

Day	Yoga session VRK(RL)	Control session SR	Yoga session VRK(LL)
Day-1	1 st Subject	2 nd Subject	3 rd Subject
Day-2	3 rd Subject	1 st Subject	2 nd Subject

Day-3	2 nd Subject	3 rd Subject	1 st Subject
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Each session was divided into four phases. Phase 1 - Supine rest; Phase 2 - Two minutes of practice of either *Vṛkṣāsana* or supine rest; Phase 3 – Recovery for five minutes; Phase 4 – post recovery for five minutes.

Phase – I 5 Minutes	Phase – II 2 Minutes	Phase – III 5 Minutes	Phase – IV 5 Minutes
Supine Rest	Āsana	Recovery	Post Recovery

4.3 INTERVENTION – VRKṢĀSANA

Each assessment took 17 minutes. The assessment began with supine rest, for 5 minutes as phase-I (Pre). Before proceeding to phase-II (during), a change over gap of 30 seconds was given to reach the final position of *Vṛkṣāsana*. Similarly at the end of this phase 30 seconds was given to come back to the position of supine rest. The duration of phase II was 2 minutes. The duration of recovery phase-III was 5 minutes. The last 5 minutes was considered the post phase. All subjects practiced the *Vākñāsana* posture using taped instructions.

Phase – I	Phase –II			Phase -III	Phase –IV
Pre Supine rest	Phase change for <i>āsana</i> session only	During <i>āsana</i> / control	Phase Change for <i>āsana</i> session only	Recovery Supine rest	Post Supine rest
5 minutes	30 Seconds	1 minutes	30 seconds	5 minutes	5 minutes

4.4 TECHNIQUE OF PERFORMING VRKṢĀSANA

Sthiti: *Supine posture*

- Slowly come to the *Ṭaḍāsana* pose with the help of both elbows.
- Stand erect; keep the feet together and the knees straight with arms on the respective sides.
- Without bending the left knee, lift the right foot and grasp the ankle with the right hand.

- Fold the right leg at the knee joint.
- Without losing balance, place right heel at the root of the left thigh, using both hands. The right sole must press the inside of the left thigh with the toes pointing downwards. The folded leg must be at right angle to the other leg and both thighs must be in alignment. Balance on the left leg.
Raise both the arms slowly above the head and join the palms. Fingers should point upwards. Straighten the arms as much as possible, *Vṛkṣāsana*.
- Stand erect. Keep balance. Look straight ahead and be relaxed.
- Lower the arms. Return to *Ṭaḍāsana* and slowly return to supine rest pose.
- Relax the whole body by spreading the legs, hands apart with palms facing the roof.
- Practice *Vṛkṣāsana* reversing the legs.

4.5 CONTROL SESSION – SUPINE REST

During performance of seventeen minutes supine rest the subject was asked to lie in the supine position with legs and hands apart, palms facing the roof with eyes closed. During this posture the subject was asked to relax his muscles completely.

4.6 ASSESSMENTS

Continuous breath by breath monitoring of the cardiac and ventilatory measures was carried out on the metabolic analyzer Oxycon Pro, Jaeger, Germany (model No. SN 808323, 2001). This computerized system is designed to monitor the variables breath by breath (almost 15 to 30 records in minutes) with a storage capacity for one hour with a continuous display facility. Calibration of the equipment was done by following instructions meticulously both by the inbuilt calibration and by using the oxygen gas cylinder. It was calibrated at least 60 minutes before recording daily in the morning. All subjects were well instructed about the design of the study and were familiarized with the instruments before the day of the experiments by visiting the laboratory on more than one occasion. For each subject, the recording time of the recording for all the three sessions was kept constant. Hence the entire batch of 33

male and female fell into two groups. One group had their recording before breakfast and the other group three hours after breakfast. The three sessions were ensured for each subject and the order was kept as day one for *Vṛkṣāsana* right leg (VRK-RL), day two for Supine rest (SR) & day three for *Vṛkṣāsana* left leg (VRK-LL) A taped instruction for the entire session (2 minutes) was used for during the phase 2 of *Vṛkṣāsana* and not for supine rest. Before starting the session all the subjects were asked to rest sitting in a chair for 5 minutes. In the mean time the mask was cleaned and details of the subjects were entered into the machine. After five minutes, the subject was asked to sit on the yoga mat while the heart digital polar electrode belt was fixed below the sternum and digital polar receiver was fixed at the waist. Then the subject was asked to breath into the cleaned mask which covered the mouth and nose. The subject was then asked to lie down for the assessment.

4.7 DATA EXTRACTION

VE : The total volume of gas expired per minute is told Minute Ventilation or VE. It includes alveolar and dead space ventilation; and is recorded in liters per minute (l/min). In healthy adults at rest breathe 5 to 10 L/min. During exercise this value may increase to more than 200 L/min. It commonly exceeds 100 L/min in healthy adults.

VO_2 : It is a measurement of the volume of oxygen used by the tissues per minute. It is the product of ventilation minute and the rate of extraction from the gas breathed. Healthy patients at rest have a VO_2 of approximately 0.25 L/min, or approximately 3.5 ml O_2 /min/kg. During exercise, VO_2 may increase to over 4.0 L/min in trained persons. It is the best single measure of external work being performed.

VCO_2 : It is a measurement of the volume of carbon dioxide excreted by the tissues per minute. It is a direct reflection of metabolism. It is expressed in liters or milliliters per minute. In healthy persons at rest is approximately 0.20 L/min. It may increase more than 4 L/min during maximal exercise in trained individuals.

EE : Energy is defined as “the capacity to do work”. Measurement of energy intake and expenditure is in terms of Kilocalories. A Kilocalorie is the amount of

heat required to raise the temperature of one Kg of water by one degree centigrade. The body has unique ability to shift the fuel mixture of carbohydrates, proteins, and fats to accommodate energy needs.

Daily total energy expenditure = Resting Energy Expenditure + Thermic effect of food + Energy expended in physical activity ($TEE = REE + TEF + EEPA$). These 3 components make up persons daily total energy expenditure.

HR: Heart rate is the number of heart beats per minute. The changes in heart rate indicate the status of physiological arousal.

RR : Respiratory rate is the number of breaths per unit of time, usually per minute.

RER : The respiratory exchange ratio (RER) is defined as the ratio of VCO_2 to VO_2 at the mouth. RER is calculated by dividing VCO_2 by VO_2 ; it is expressed as a fraction. RER normally varies between 0.70 and 1.00 in resting patients. In some circumstances, RER at rest is assumed to be equal to 0.8. For exercise evaluation or metabolic studies, however, the actual value is calculated.

4.8 DATA ANALYSIS

Statistical analysis was done using SPSS Version 10.0 after selecting the appropriate test. The raw data obtained for each subject in each recording session were tabulated separately and the methods of statistical analysis are given below:

(i) The group mean and standard deviation were calculated and data were tested for variance and normal distribution by F test and Kolmogorov-Smirnov test respectively.

(ii) Repeated measures analyses of variance (ANOVA) were performed with two 'Within subjects' factors, i.e., Factor 1: Sessions; VRK and SR and Factor 2: Phases; Pre, During, Recovery and Post. These repeated measures ANOVA were carried out for each variable separately.

(iii) For the normally distributed paired t – tests were performed to compare the data of the 'during' and the 'post' periods with those of the respective 'pre' period.

Above statistical tests were performed separately for males, females and entire group as a whole. The gender difference was checked by Independent Sample 't' test.

CHAPTER-5 RESULTS

The respiratory and metabolic variables (i.e., VE, RR, HR, RER, VO_2 , VCO_2 , and EE) were recorded in 33 subjects (16males, 17 females) during the practice of *Vṛkṣāsana* on right leg (VRK-RL), *Vṛkṣāsana* on left leg (VRK-LL) and Supine Rest (SR). The data were analyzed separately for whole group, for males & females.

As described under methods (data analysis), the data were analyzed for normal distribution and variance. It shows that the data were found to be normally distributed and of equal variance.

Minute ventilation (V_E): The repeated measures ANOVA which consisted of the three within-subjects factors, i.e., Sessions (*Vṛkṣāsana* Right Leg, *Vṛkṣāsana* Left Leg and Supine rest) and (ii) phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=34.208$, $p<0.001$), between the phases ($F=124.535$, $p<0.001$), and the interactions between the Sessions and phases ($F=66.823$, $p<0.001$).

In the *Vṛkṣāsana* Right Leg session the male group average of total Minute Ventilation significantly increased by 87.41%, 31.90% in 'during' and 'recovery' states respectively [$p<0.001$ (2 tailed) paired t-test]. In the *Vṛkṣāsana* Left Leg session the same is also significantly increased by 81.41%, 29.24% in 'during' and 'recovery' states respectively [$p<0.001$ (2 tailed) paired t-test] compared to base line values. In the Supine Rest session there was no significant change observed in all the phases in respiratory rate.

In the *Vṛkṣāsana* Right Leg session the female group average of total minute ventilation significantly increased by 51.60%, 18.50% in 'during' and 'recovery' phases respectively [$p<0.001$ (2 tailed) paired t-test] compared to base line values. There was a significant reduction by 5.34% after Post session [$p<0.05$ (2 tailed)]

paired t-test]. In the *Vṛkṣāsana* Left Leg session the female group average of total minute ventilation significantly increased by 54.83%, 20.48% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. In the Supine Rest session the total minute ventilation significantly reduced by 5.24%, 4.84% and 5.20% in during, recovery and post phase respectively [$p < 0.05$ (2tailed) paired t-test] compared to base line values.

Respiratory rate (RR): The repeated measures ANOVA which consisted of the three within-subjects factors, i.e., Sessions (*Vṛkṣāsana* Right Leg, Left Leg and Supine rest) and (ii) Phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=15.504$, $p < 0.001$), between the phases ($F=64.994$, $p < 0.001$) and the interactions between the Sessions and phases ($F=27.894$, $p < 0.001$)

In the *Vṛkṣāsana* Right Leg session the male group average respiratory rate significantly increased by 40.22% in during [$p < 0.001$ (2 tailed) paired t-test] compared to the baseline values. In the *Vṛkṣāsana* Left Leg session the group average respiratory rate significantly increased by 33.53% in during [$p < 0.001$ (2 tailed) paired t-test]. There was no significant change in recovery and post phases of in respiratory rate. In the Supine Rest session there was no significant change observed in all the phases in respiratory rate.

For female, the group average respiratory rate significantly increased by 28.68% and 24.88% in during [$p < 0.001$ (2 tailed) paired t-test] in the *Vṛkṣāsana* Right Leg session and *Vṛkṣāsana* Left Leg session respectively. In the Supine Rest session there was no significant change observed in all the phases in respiratory rate.

Heart rate (HR): The repeated measures ANOVA which consisted of the three within-subjects factors, i.e., Sessions (*Vṛkṣāsana* Right Leg, Left Leg and Supine rest) and (ii) Phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=43.617$, $p < 0.0001$), between the phases ($F=344.301$,

$p < 0.0001$), and the interactions between the Sessions and phases ($F=145.421$, $p < 0.0001$).

In the *Vṛkṣāsana* Right Leg session the male group average of heart rate significantly increased by 43.33% in 'during' [$p < 0.001$ (2 tailed) paired t-test] and by 3.45% in 'recovery' [$p < 0.05$ (2 tailed) paired t-test] phases. There was a significant increase by 41.88% of heart rate in during [$p < 0.001$ (2 tailed) paired t-test] after the practice of *Vṛkṣāsana* Left Leg session. In the Supine Rest session it was significantly decreased in recovery and post phases by 2.37% and 3.86% [$p < 0.05$ (2 tailed) paired t-test] respectively.

In the *Vṛkṣāsana* Right Leg session the female group average of heart rate significantly increased by 37.88% in 'during' [$p < 0.001$ (2 tailed) paired t-test]. There was a significant increase by 38.34% of heart rate in during [$p < 0.001$ (2 tailed) paired t-test] after the practice of *Vṛkṣāsana* Left Leg session. In the Supine Rest session it was significantly decreased in recovery and post phases by 2.90% [$p < 0.01$ (2 tailed) paired t-test] and 3.92% [$p < 0.05$ (2 tailed) paired t-test] respectively.

Respiratory Exchange Ratio (RER): The repeated measures ANOVA which consisted of the three within-subjects factors, i.e., Sessions (*Vṛkṣāsana* Right Leg, Left Leg and Supine rest) and (ii) phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=2.713$, $p=0.084$), between the phases ($F=6.029$, $p=0.004$), and the interactions between the Sessions and phases ($F=1.279$, $p=0.275$).

The male group average respiratory exchange ratio significantly increased by 2.86% and 2.97% in recovery [$p < 0.05$ (2 tailed) paired t – test] compared to the baseline values in *Vṛkṣāsana* Right Leg and *Vṛkṣāsana* Left Leg session respectively. There was no significant change in post phases in respiratory exchange ratio. In the Supine Rest session there was also no significant change observed in all the three phases.

The female group average respiratory exchange ratio significantly increased by 1.84% and 3.10% in recovery [$p < 0.05$ (2 tailed) paired t – test] compared to the baseline values in *Vṛkṣāsana* Right Leg and *Vṛkṣāsana* Left Leg session respectively. There was no significant change in post phases in respiratory exchange ratio. In the Supine Rest session there was no significant change observed in all the three phases.

Oxygen consumption (VO_2): The repeated measures ANOVA which consisted of the three within-subjects factors, i.e., Sessions (*Vṛkṣāsana* Right Leg, Left Leg and Supine rest) and (ii) Phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=48.829$, $p < 0.0001$), between the phases ($F=169.506$, $p < 0.0001$), and the interactions between the Sessions and phases ($F=87.373$, $p < 0.0001$).

In the *Vṛkṣāsana* Right Leg session the male group average of oxygen consumption significantly increased by 84.49% (ml/min), 38.19% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. There was no significant change in oxygen consumption after Post session. In the *Vṛkṣāsana* Left Leg session the male group average of oxygen consumption significantly increased by 87.75% (ml/min), 35.04% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. There was no significant change in oxygen consumption after Post session. In the Supine Rest session there was no significant change in oxygen consumption in any phase.

In the *Vṛkṣāsana* Right Leg session the female group average of oxygen consumption significantly increased by 59.15% (ml/min), 20.68% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. There was significant reduction in oxygen consumption by 5.48% after (Post) *Vṛkṣāsana* from baseline (Pre) phase [$p < 0.05$ (2 tailed) paired t-test]. In the *Vṛkṣāsana* Left Leg session the female group average of oxygen consumption significantly increased by 63.58%

(ml/min), 22.79% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. There was significant reduction in oxygen consumption by 5.05% after (Post) *Vṛkṣāsana* from baseline (Pre) phase [$p < 0.05$ (2 tailed) paired t-test]. In the Supine Rest session the Oxygen consumption significantly reduced by 6.65%, 6.05% and 6.64% in 'during' [$p < 0.01$ (2tailed) paired t-test], 'recovery' [$p < 0.01$ (2tailed) paired t-test] and post [$p < 0.01$ (2tailed) paired t-test] phases respectively compared to base line.

Carbon dioxide output (VCO_2): The repeated measures ANOVA which consisted of the three within-subjects factors, i.e., Sessions (*Vṛkṣāsana* and Supine Rest) and (ii) Phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=31.970$, $p < 0.0001$) between the phases ($F=125.311$, $p < 0.0001$), and the interactions between the Sessions and phases ($F=69.252$, $p < 0.0001$).

In the *Vṛkṣāsana* Right Leg session the male group average of Carbon dioxide output significantly increased by 86.41%, 41.11% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. In the *Vṛkṣāsana* Left Leg session the male group average of Carbon dioxide output significantly increased by 85.94%, 37.54% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. There were no significant changes observed in the phases of Supine Rest.

In the *Vṛkṣāsana* Right Leg session the female group average of Carbon dioxide output significantly increased by 54.19%, 22.62% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test]. There was a significant reduction in Carbon dioxide output by 7.11% in 'Post' phase [$p < 0.01$ (2 tailed) paired t-test] . In the *Vṛkṣāsana* Left Leg session the female group average of Carbon dioxide output significantly increased by 58.98%, 26.25% in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test] and significantly decreased by 5.29% in post phase [$p < 0.05$ (2 tailed) paired t-test]. In the Supine rest session the female group average of Carbon dioxide output significantly decreased by 8.12% in 'during'

[$p < 0.001$ (2 tailed) paired t-test] and 6.26%, 6.40% in 'recovery' and 'post' phases respectively [$p < 0.05$ (2 tailed) paired t-test].

Energy Expenditure (EE): The repeated measures ANOVA which consisted of the two within-subjects factors, i.e., Sessions (*Vṛkṣāsana* and Supine Rest) and (ii) Phases (Pre, During, Recovery, Post) showed a significant difference between the Sessions ($F=45.541$, $p < 0.0001$), between the phases ($F=159.594$, $p < 0.0001$), and the interactions between the Sessions and phases ($F=81.937$, $p < 0.0001$).

In the *Vṛkṣāsana* Right Leg session the male group average of energy expenditure significantly increased by 87.25% (kcal/day), 39.84% (kcal/day) in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test] compared to the baseline values. In the *Vṛkṣāsana* Left Leg session the male group average of energy expenditure significantly increased by 89.93% (kcal/day), 36.28% (kcal/day) in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test] compared to the baseline values. In the Supine Rest session there were no significant changes observed in all the phases.

In the *Vṛkṣāsana* Right Leg session the female group average of energy expenditure significantly increased by 60.68% (kcal/day), 21.68% (kcal/day) in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test] compared to the baseline values. In the *Vṛkṣāsana* Left Leg session the female group average of energy expenditure significantly increased by 64.75% (kcal/day), 24.35% (kcal/day) in 'during' and 'recovery' phases respectively [$p < 0.001$ (2 tailed) paired t-test] compared to the baseline values. In the Supine Rest session the female group average of energy expenditure significantly reduced by 7.19% (kcal/day) in 'during' [$p < 0.001$ (2 tailed) paired t-test] and reduced by 6.50% (kcal/day), 7.06% in 'recovery' and 'post' phases respectively [$p < 0.01$ (2 tailed) paired t-test] compared to the baseline values.

Table 1: Seven variables recorded in 'pre', 'during', 'recovery' and 'post' states of VRK-RL session of *males*. Values are percent change or actual units as specified.

Variables	During (2 min)	Recovery (5 min)	Post (5 min)
V _E (Minute Ventilation),(l/min)	↑87.41*** (l/min)	↑31.90*** (l/min)	NS
RR (Respiratory Rate) (c /min)	↑40.22*** (c/min)	NS	NS
HR (Heart beat) (b /min)	↑43.33*** (b /min)	↑3.45* (b /min)	NS
RER (Respiratory Exchange Ratio)	NS	↑2.86* (%)	NS
V _{O₂} (Oxygen Consumption) (ml/min)	↑84.49*** (%)	↑38.19*** (%)	NS
V _{CO₂} (Carbon dioxide elimination)(ml/min)	↑86.41*** (%)	↑41.11*** (%)	NS
EE (Energy Expenditure) (kcal/day)	↑87.25*** (%)	↑39.84*** (%)	NS

n = 16, * p<0.05, ** P<0.01, *** P<0.001, paired t-test (2 tailed), 'during', 'recovery' and 'post' compared respective pre.

Table 2: Seven variables recorded in 'pre', 'during', 'recovery' and 'post' states of VRK-LL session of *males*. Values are percent change or actual units as specified.

Variables	During (2 min)	Recovery (5 min)	Post (5 min)
V _E (Minute Ventilation),(l/min)	↑81.41*** (l/min)	↑29.24*** (l/min)	NS
RR (Respiratory Rate) (c /min)	↑33.53*** (c/min)	NS	NS
HR (Heart beat) (b /min)	↑41.88*** (b /min)	NS	NS
RER (Respiratory Exchange Ratio)	NS	↑2.97* (%)	NS
V _{O₂} (Oxygen Consumption) (ml/min)	↑87.75*** (%)	↑35.04*** (%)	NS
V _{CO₂} (Carbon dioxide elimination)(ml/min)	↑85.94*** (%)	↑37.54*** (%)	NS

EE (Energy Expenditure) (kcal/day)	↑89.93*** (%)	↑36.28*** (%)	NS
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n =16, * p<0.05, ** P<0.01, *** P<0.001, paired t-test (2 tailed), ‘during’, ‘recovery’ and ‘post’ compared respective pre.

Table3: Seven variables recorded in ‘pre’, ‘during’, ‘recovery’ and ‘post’ states of **SR** session of **males**. Values are percent change or actual units as specified.

Variables	During (2 min)	Recovery (5 min)	Post (5 min)
V _E (Minute Ventilation),(l/min)	NS	NS	NS
RR (Respiratory Rate) (c /min)	NS	NS	NS
HR (Heart beat) (b /min)	NS	↓2.37*	↓3.86*
RER (Respiratory Exchange Ratio)	NS	NS	NS
V _{O2} (Oxygen Consumption) (ml/min)	NS	NS	NS
V _{CO2} (Carbon dioxide elimination)(ml/min)	NS	NS	NS
EE (Energy Expenditure) (kcal/day)	NS	NS	NS

n =16, * p<0.05, ** P<0.01, *** P<0.001, paired t-test (2 tailed), ‘during’, ‘recovery’ and ‘post’ compared respective pre

Table 4: Seven variables recorded in ‘pre’, ‘during’, ‘recovery’ and ‘post’ states of **VRK-RL** session of **females**. Values are percent change or actual units as specified.

Variables	During (2 min)	Recovery (5 min)	Post (5 min)
V _E (Minute Ventilation),(l/min)	↑51.60*** (l/min)	↑18.50*** (l/min)	↓5.34* (l/min)
RR (Respiratory Rate) (c /min)	↑28.68 *** (c/min)	NS	NS
HR (Heart beat) (b /min)	↑37.88*** (b /min)	NS	NS
RER (Respiratory Exchange Ratio)	NS	↑1.84* (%)	↓1.60* (%)

V _{O2} (Oxygen Consumption) (ml/min)	↑59.15*** (%)	↑20.68*** (%)	↓5.48** (%)
V _{CO2} (Carbon dioxide elimination)(ml/min)	↑54.19*** (%)	↑22.62*** (%)	↓7.11** (%)
EE (Energy Expenditure) (kcal/day)	↑60.18 *** (%)	↑21.68*** (%)	↓6.00** (%)

n =17, * p<0.05, ** P<0.01, *** P<0.001, paired t-test (2 tailed), ‘during’, ‘recovery’ and ‘post’ compared respective pre.

Table 5: Seven variables recorded in ‘pre’, ‘during’, ‘recovery’ and ‘post’ states of VRK-LL sessions of females. Values are percent change or actual units as specified.

Variables	During (2 min)	Recovery (5 min)	Post (5 min)
V _E (Minute Ventilation),(l/min)	↑54.83*** (l/min)	↑20.48* ** (l/min)	NS
RR (Respiratory Rate) (c /min)	↑24.88*** (c/min)	NS	NS
HR (Heart beat) (b /min)	↑38.34*** (b /min)	NS	↓3.83** (b /min)
RER (Respiratory Exchange Ratio)	NS	↑3.10* (%)	NS
V _{O2} (Oxygen Consumption) (ml/min)	↑63.58*** (%)	↑22.79*** (%)	↓5.05* (%)
V _{CO2} (Carbon dioxide elimination)(ml/min)	↑58.98*** (%)	↑26.25 *** (%)	↓5.29* (%)
EE (Energy Expenditure) (kcal/day)	↑64.75*** (%)	↑24.35 *** (%)	↓5.25* (%)

n = 17, * p<0.05, ** P<0.01, *** P<0.001, paired t-test (2 tailed), ‘during’, ‘recovery’ and ‘post’ compared respective pre.

Table 6: Seven variables recorded in ‘pre’, ‘during’, ‘recovery’ and ‘post’ states of SUPINE REST sessions of females. Values are percent change or actual units as specified.

Variables	During (2 min)	Recovery (5 min)	Post (5 min)
V _E (Minute Ventilation),(l/min)	↓5.24** (l/min)	↓4.84* (l/min)	↓5.20* (l/min)
RR (Respiratory Rate) (c /min)	NS	NS	NS

HR (Heart beat) (b /min)	↓2.90** (b /min)	NS	↓3.92* (b /min)
RER (Respiratory Exchange Ratio)	NS	NS	NS
V _{O2} (Oxygen Consumption) (ml/min)	↓6.65** (%)	↓6.05** (%)	↓6.64** (%)
V _{CO2} (Carbon dioxide elimination)(ml/min)	↓8.12*** (%)	↓6.26* (%)	↓6.40* (%)
EE (Energy Expenditure) (kcal/day)	↓7.19*** (%)	↓6.50** (%)	↓7.06** (%)

n = 17, * p<0.05, ** P<0.01, *** P<0.001, paired t-test (2 tailed), ‘during’, ‘recovery’ and ‘post’ compared respective pre.

CHAPTER-6 DISCUSSION

In the present study respiratory and metabolic variables were assessed in 33 subjects (16 males and 17 females), before, during and after the practice of

Vṛkṣāsana on Right Leg (VRK-RL) and *Vṛkṣāsana* on Left Leg (VRK-LL) and Supine Rest (SR). There was increase in respiratory rate (RR) by 40.22%, 28.68% during VRK-RL session and increase by 33.53%, 24.88% during VRK-LL session in Male and Female respectively compare to base line values, whereas no significant change in RR was observed during SR session. The heart rate (HR) increased by 43.33%, 37.88% during VRK-RL session and also increased by 41.88%, 38.34% during VRK-LL session in Male and Female respectively; compared to baseline values. However significant decrease in HR was reported in recovery and post phases in SR session for Male by 2.37% and 3.86% respectively, whereas, for female, it is shown in during and post phase by 2.90% and 3.92% respectively. The minute ventilation (V_E) significantly increased by 87.41%, 51.60% during VRK-RL session and 81.41%, 54.83% during VRK-LL session in male and female respectively. For female V_E had significant decrease by 5.24%, 4.84% and 5.20% in during, recovery and post phases in SR session respectively compared to baseline values. In VRK-RL session, the oxygen consumption (VO_2) significantly increased by 84.49%, 38.19% in during and recovery phase for male and 59.15%, 20.68% for female respectively, whereby VO_2 reduced by 2.91% and 5.48% in post session for male and female respectively compared to baseline values. In VRK-LL session (VO_2) significantly increased by 87.75%, 35.04% for male and 63.58%, 22.79% for female in during and recovery phases respectively, whereby VO_2 reduced by 3.04% and 5.05% in post session for male and female respectively compared to baseline values. In SR session, a significant reduction of VO_2 by 6.65%, 6.05%, and 6.64% in during, recovery and post phases are shown in female respectively. In VRK-RL session, the carbon dioxide output (VCO_2) significantly increased by 86.41% and 41.11% for male and 54.19% and 22.62% for female in during and recovery phases respectively compared to baseline values. In VRK-LL session, the same are increased significantly by 85.94% and 37.54% for male and 58.98% and 26.25% for female in during and recovery phase respectively. In SR session, for female, (VCO_2) significantly reduced by 8.12%, 6.26%, and 6.40% in during, recovery and post phases respectively. In VRK-RL session, the energy expenditure (EE) significantly increased by 87.25% and 39.84% for male and 60.18% and 21.68% for female in during and recovery phases

respectively, followed by 2.78% and 6.00% reduction of (EE) in post phase in male and female respectively compared to baseline values. In VRK-LL session, the same are increased significantly by 89.93% and 36.28% for male and 64.75% and 24.35% for female in during and recovery phase respectively, followed by 3.03% and 5.24% reduction of (EE) in post phase in male and female respectively. In SR session, for female, (EE) significantly reduced by 7.19%, 6.50%, and 7.06% in during, recovery and post phases respectively.

Vṛkṣāsana is a standing balancing posture, which requires greater muscular effort. The increase in respiratory rate, heart rate during the practice of *Vṛkṣāsana* indicates the mild physiological arousal whereas the increase in VE, VO₂, VCO₂ and EE suggest the practice of *Vṛkṣāsana* provides moderate exercise to the system.

The previous studies done on *Siddhāsana* (sitting meditative posture) and *Virāsana* (an effortful standing posture) have shown increase in oxygen consumption by 23% & 160% (Rai et al., 1994), (Rai et al., 1993) respectively. Similarly a study on headstand has shown 68.6% increase in oxygen consumption during the practice. During the practice of *Viparītakaraṇi* an inverted posture, increase of respiratory rate, heart rate indicates the mild physiological arousal, whereas increase on VE, VO₂, VCO₂ suggests moderate exercise to the practice (Ramana V, 2004). A significant reduction had shown in *Padahastāsana* (Pradhan B, 2003), *Ardhakati cakrāsana* from left side (Sanahal S P, 2003), *Ardhakati cakrāsana* from right side (Ningombam G S, 2003) and *Ardhacakrāsana*.

It is seen in both VRK-RL and VRK-LL session in both genders that there is significant increase in O₂ consumption, EE in the during and recovery phases comparing to the base line value but the increase in both cases are less in recovery phase than in during phase, and the reduction of O₂ consumption, EE in post phases below the baseline value is also to be noted. A significant increase in HR followed by return to lower than baseline values also indicates the deep relaxing effect of this yogic posture. It proves that the relaxation and rest below the initial levels which is the aim of any yoga practice, be it physical (*āsana*) or breathing (*prāṇāyāma*) or

meditation. Therefore, it can be told that *Yogāsanas* or yogic postures with the increase of muscular effort can be useful as an aerobic exercises followed by deep relaxation.

Table 7: Percentage changes within, pre (phase 1), during (phase 2), recovery (phase 3) and post (phase 4) of different *āsanas*.

Asanas	Variables	pre vs dur (ph 1- ph 2)	pre vs rec (ph 1 – ph 3)	pre vs post (ph 1- ph 4)
<i>Padahastāsana</i>	V _{O2} (ml/min)	70 %	16 %	- 8 %
	EE (kcal/min)	71 %	16 %	- 8 %
	HR (b/min)	41%	-4%	-4.5%
<i>Ardhakati cakrāsana (left side)</i>	V _{O2} (ml/min)	31 %	12 %	-10 %
	EE(kcal/min)	32 %	12 %	-10%
	HR (b/min)	41%	-3%	-4%
<i>Ardhacakrāsana</i>	V _{O2} (ml/min)	46%	17 %	-11%
	EE (kcal/min)	48 %	15 %	- 11 %
<i>Viparītakaraṇi (Group 30 + 20)</i>	V _{O2} (ml/min)	84 %	15 %	- 7 %
	EE (kcal/min)	86 %	17 %	- 8 %
	HR (b/min)	25.08%	1.29%	-1.73%
<i>Ardhakati cakrāsana (right side)</i>	V _{O2} (ml/min)	32%	16%	-7%
	EE (kcal/min)	32%	16%	-8%
	HR (b/min)	55%	-4%	-3%
<i>Vajrāsana</i>	V _{O2} (ml/min)	-1.64%	2.75%	-11.08%
	EE (kcal/min)	-0.27%	3.06%	-11.42%
	HR (b/min)	16.95%	-2.70%	-4.61%
<i>Vṛkṣāsana (on Right Leg)</i>	V _{O2} (ml/min)	72.64%	30.00%	-4.12%
	EE (kcal/min)	74.63%	31.38%	-4.28%
	HR (b/min)	40.38%	1.50%	-1.55%
<i>Vṛkṣāsana (on Left Leg)</i>	V _{O2} (ml/min)	76.58%	29.38%	-3.93%
	EE (kcal/min)	78.32%	30.78%	-4.05%
	HR (b/min)	39.95%	0.18%	-3.10%

Legend: V_{O2} (oxygen consumption) and EE(energy expenditure) variables Percentage values are shown in 3 columns for all three asanas..

CHAPTER – 7

CONCLUSIONS

During the practice of *Vṛkṣāsana* on Right Leg, the oxygen consumption and energy expenditure increased by 72.64%, 74.63% followed by 4.12%, 4.28% reduction in 'post' phase respectively. And during the practice of *Vṛkṣāsana* on Left Leg, the oxygen consumption and energy expenditure increased by 76.58%, 78.32% followed by 3.93%, 4.05% reduction in 'post' phase respectively. The control session of supine rest showed continuous reduction in these variables. Respiratory rate and heart rate increased significantly during both *Vṛkṣāsana* on Right Leg and *Vṛkṣāsana* on Left Leg but not in supine rest. These findings suggest that *Vṛkṣāsana* is a mild type of postural exercise and leads to deeper relaxation after its practice.

CHAPTER – 8

SUGGESTIONS FOR FUTURE

1. Other physiological assessments like autonomic variables and heart rate variability could be studied during the practice of *Vṛkṣāsana*.
2. Other standing balancing practices may be studied on similar design.
3. The therapeutic application of this posture may be studied.

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