

**EFFECT OF INTEGRATED APPROACH OF YOGA THERAPY ON BACK  
PAIN AS MEASURED BY ROLLAND MORRIS DISABILITY INDEX**

*Dissertation submitted by*

**JALANDHAR BHATTA**

*Under the guidance of*

**PADMINI TEKUR, PH.D.**

**TIKHE SHAM GANPAT RUDRANATH, PH.D.**



Towards the partial fulfillment of Master of Science in Yoga

[M.Sc. Yoga]



**To**

**SWAMI VIVEKANANDA YOGA ANUSANDHANA SAMATHANA (S-VYASA)**

(Deemed to be University, Recognized by UGC)

# 19, Eknath Bhavan, Gavipuram Circle, Bengaluru - 560 019, India

## CERTIFICATE

This is to certify that Jalandhar Bhatta is submitting this Literary Research entitled **“REVIEW OF LITERATURE ON SUFFERINGS IN THE FORM OF KLEŚAS ANTARĀYAS AND VIKṢEPASAHABHUVA AND THEIR REMEDIES ACCORDING TO PATAÑJALI YOGA SŪTRA”** and Experimental research entitled **“EFFECT OF INTEGRATED APPROACH OF YOGA THERAPY ON BACK PAIN AS MEASURED BY ROLLAND MORRIS DISABILITY INDEX”** in partial fulfillment of the requirement for the Master of Science (Yoga) registered with effect from August 1, 2011 by Swami Vivekananda Yoga Anusandhāna Saṁsthāna (S-VYASA) University under the Division of Life Sciences and is a record of the work carried out by him in this university.

Guides

**Dr Padmini Tekur Ph.D.**

**Dr Tikhe Sham Ganpat Rudranath Ph.D.**

Date:

Place: Bengaluru

## **D E C L A R A T I O N**

I, hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhāna Samsthāna (S-VYASA) University, Bengaluru, under the guidance of Dr. Tikhe Sham Ganpat Rudranath, Assistant Professor, S-VYASA University Bengaluru and Dr. Padmini Tekur, Assistant Professor, S-VYASA University Bengaluru. I also declare that the subject matter of my dissertation entitled **“EFFECT OF INTEGRATED APPROACH OF YOGA THERAPY ON BACK PAIN AS MEASURED BY ROLLAND MORRIS DISABILITY INDEX”** has not previously formed the basis of the award of any degree, diploma, associate-ship, fellowship or similar titles.

**Date:**

**Place: Bengaluru**

**Jalandhar Bhatta**

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

I would like to express my deepest gratitude to my guides Dr. Padmini Tekur and Dr. Tikhe Sham Ganpat (Rudranath) for their guidance and encouragement. They are my mentors and I am unable to express their contribution in my development through words.

I thank to Dr. Nagaratna, Dr. Nagendra, Dr. kasinath and Dr. Natesh for their valuable guidance and support.

I would like to thank all the participants involved in my research as subjects.

I will be always grateful to my university, Swami Vivekananda Yoga Anusandhāna Saṁsthāna (S-VYASA) for its support in promoting my career.

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

Finally I thank to the divinity without whose wish, this work wouldn't have been possible.

**Date:**

**Jalandhar Bhatta**

**Place: Bengaluru**

**Name of the candidate**

STANDARD INTERNATIONAL TRANSLITERATION CODE USED TO  
TRANSLITERATE SANSKRIT WORDS

a	=	अ	ña	=	ढ	pa	=	प
ā	=	आ	ca	=	च	pha	=	फ
i	=	इ	cha	=	छ	ba	=	ब
ī	=	ई	ja	=	ज	bha	=	भ
u	=	उ	jha	=	झ	ma	=	म
ū	=	ऊ	ñ	=	ञ	ya	=	य
ṛ	=	ऋ	ṭa	=	ट	ra	=	र
ṝ	=	ॠ	ṭha	=	ठ	la	=	ल
e	=	ए	ḍa	=	ड	va	=	व
ai	=	ऐ	ḍha	=	ढ	śa	=	श
o	=	ओ	ṇa	=	ण	ṣa	=	ष
au	=	औ	ta	=	त	sa	=	स
m̐	=	अं	tha	=	थ	ha	=	ह
ḥ	=	अः	da	=	द	kṣa	=	क्ष
ka	=	क	dha	=	घ	tra	=	त्र
kha	=	ख	na	=	न	jña	=	ज्ञ
ga	=	ग	gha	=	घ			

## ABSTRACT

**Background and need for the study:** Previous studies have demonstrated that yoga was effective for chronic low back pain (CLBP) in adults with high socioeconomic status. The effect of 7 days Integrated Approach of Yoga Therapy (IAYT) on Rolland Morris Disability Index (RMDI) was not reported adequately.

**Objective:** To study the effect of IAYT on RMDI in patients with CLBP

**Methods:** A seven days study with a single group pre-post design was conducted in a residential holistic health Centre at Bangalore, India. Thirty five patients (22 females, 13 males) with CLBP were selected conveniently to undergo IAYT. The IAYT consisted of a seven days-long intensive residential yoga program comprising of Āsanās (physical postures) designed for back pain, Prāṇāyāma (breathing practices) and meditation apart from interactive sessions on philosophical concepts of yoga. Primary outcomes were change from baseline to 7 days in 24-point RMDI, Pain Analogue Scale (PAN), Symptom Score (SS), Spinal mobility with 'Sit and Reach' instrument (SAR), Straight leg raising test (SLR) using a Goniometer, State-Trait Anxiety Inventory (STAI) form X1 and X2, 24-point Back Depression Inventory (BDI) and General Health Questionnaire (GHQ- 28). The clinical outcomes were blood pressure (BP), pulse rate (PR), respiratory rate (RR), breath holding time (BHT) and weight (WT).

**Statistical Analysis:** The tests of normality (Shapiro-Wilk) and Paired Samples Test were used with the help of SPSS 16 for complete statistical analysis.

**Results:** The significant change was observed in all the variables. The analysis showed 54.13% decrease in RMDI scores ( $P<0.001$ ). Similarly, the PAS showed 86.20% decrease

( $P < 0.001$ ). There were 75% decrease in SS score ( $P < 0.001$ ), 41.9643% increase in SAR score ( $P < 0.001$ ), 40.57%, 34.55 increase in both right and left SLR score ( $P < 0.001$ ), 40.10%.38.82% decrease in STAI and STA2 score ( $P < 0.001$ ) and 69.90% decrease in BDI score ( $P < 0.001$ ). Further, the data analysis of GHQ score showed 87.76% decrease ( $P < 0.001$ ) in somatic symptoms, 89.29% decrease ( $P < 0.001$ ) in anxiety and insomnia, 86.96% decrease ( $P < 0.001$ ) in social dysfunction, 84.75% decrease ( $P < 0.001$ ) in severe depression and 87.71% decrease ( $P < 0.001$ ) in all medical complaints. Moreover, clinical investigation showed 6.947% decrease in Systolic BP ( $P < 0.001$ ), 7.5% decrease in Diastolic BP ( $P < 0.001$ ), 7.01% decrease in PR ( $P < 0.001$ ), 18.7 % decrease in RR ( $P < 0.001$ ), 40.57% increase in BHT ( $P < 0.001$ ) and 1.8 % decrease in WT ( $P < 0.001$ ).

**Conclusion:** The seven days intensive residential IAYT program reduces pain, anxiety, depression and improves spinal mobility and general health in patients with CLBP. Additional randomized control trials are needed before a strong recommendation can be made.

**Key words:** Integrated Approach of Yoga Therapy, chronic low back pain, Rolland Morris Disability Index

<b>CHAPTER NO.</b>	<b>CONTENTS</b>	<b>PAGE NO.</b>
<b>CHAPTER 1</b>	<b>INTRODUCTION</b>	<b>2</b>
<b>1.1</b>	<b>REVIEW OF LITERATURE ON SUFFERINGS IN THE FORM OF KLEŚAS ANTARĀYAS AND VIKṢEPASAHABHUVA AND THEIR REMEDIES ACCORDING TO PATAÑJALI YOGA SŪTRA</b>	<b>4</b>
<b>1.1.1</b>	<b>CONCEPT OF KLEŚAS</b>	<b>4</b>
<b>1.1.2</b>	<b>CONCEPT OF ANTARĀYAS</b>	<b>13</b>
<b>1.1.3</b>	<b>CONCEPT OF VIKṢEPASAHABHUVA</b>	<b>14</b>
<b>1.2</b>	<b>REMEDIES FOR SUFFERINGS IN THE FORM OF KLEŚAS ANTARĀYAS AND VIKṢEPASAHABHUVA ACCORDING TO PATAÑJALI YOGA SŪTRA</b>	<b>14</b>
<b>1.3</b>	<b>SUMMARY AND CONCLUSION</b>	<b>20</b>
<b>2</b>	<b>INTRODUCTION</b>	<b>21</b>
<b>3</b>	<b>AIM AND OBJECTIVES</b>	<b>33</b>

<b>3.1</b>	<b>AIM</b>	<b>34</b>
<b>3.2</b>	<b>OBJECTIVES</b>	<b>34</b>
<b>3.3</b>	<b>RESEARCH QUESTIONS</b>	<b>34</b>
<b>3.4</b>	<b>HYPOTHESIS</b>	<b>35</b>
<b>3.5</b>	<b>NULL HYPOTHESIS</b>	<b>35</b>
<b>3.6</b>	<b>RATIONALE</b>	<b>35</b>
<b>4</b>	<b>METHODS</b>	<b>36</b>
<b>4.1</b>	<b>SUBJECTS</b>	<b>37</b>
<b>4.1.1</b>	<b>INCLUSION CRITERIA</b>	<b>38</b>
<b>4.1.2</b>	<b>EXCLUSION CRITERIA</b>	<b>38</b>
<b>4.1.3</b>	<b>SOURCE</b>	<b>38</b>
<b>4.1.4</b>	<b>EHTICAL CONSIDERATION</b>	<b>38</b>
<b>4.2</b>	<b>DESIGN</b>	<b>39</b>
<b>4.3</b>	<b>INTERVENTION</b>	<b>39</b>
<b>4.4</b>	<b>ASSESSMENTS</b>	<b>46</b>
<b>4.4.1</b>	<b>24-POINT ROLAND-MORRIS DISABILITY INDEX (RMDI)</b>	<b>46</b>
<b>4.4.2</b>	<b>PAIN ANALOGUE SCALE (PAS)</b>	<b>46</b>

<b>4.4.3</b>	<b>SYMPTOM SCORE (SS)</b>	<b>47</b>
<b>4.4.4</b>	<b>SPINAL MOBILITY WITH ‘SIT AND REACH’ INSTRUMENT (SAR)</b>	<b>47</b>
<b>4.4.5</b>	<b>STRAIGHT LEG RAISING TEST (SLR) USING A GONIOMETER</b>	<b>47</b>
<b>4.4.6</b>	<b>STATE-TRAIT ANXIETY INVENTORY (STAI) FORM X1 AND X2</b>	<b>48</b>
<b>4.4.7</b>	<b>24-POINT BACK DEPRESSION INVENTORY (BDI)</b>	<b>48</b>
<b>4.4.8</b>	<b>GENERAL HEALTH QUESTIONNAIRE (GHQ- 28)</b>	<b>48</b>
<b>4.4.9</b>	<b>BLOOD PRESSURE (BP)</b>	<b>49</b>
<b>4.4.10</b>	<b>PULSE RATE (PR)</b>	<b>49</b>
<b>4.4.11</b>	<b>RESPIRATORY RATE (RR)</b>	<b>49</b>
<b>4.4.12</b>	<b>BREATH HOLDING TIME (BHT)</b>	<b>50</b>
<b>4.4.13</b>	<b>WEIGHT (WT)</b>	<b>50</b>
<b>5</b>	<b>DATA ANALYSIS</b>	<b>51</b>
<b>6</b>	<b>RESULTS</b>	<b>53</b>
<b>7</b>	<b>DISCUSSION</b>	<b>55</b>
<b>8</b>	<b>CONCLUSION</b>	<b>63</b>
<b>8.1</b>	<b>IMPLICATION OF THE STUDY</b>	<b>64</b>

<b>8.2</b>	<b>STRENGTH OF THE STUDY</b>	<b>64</b>
<b>8.3</b>	<b>LIMITATIONS OF THE STUDY</b>	<b>64</b>
<b>8.4</b>	<b>SUGGETIONS FOR THE FUTURE STUDY</b>	<b>64</b>
<b>8.5</b>	<b>THE HOPE AND THE FUTURE PERSPECTIVE</b>	<b>65</b>
<b>9</b>	<b>REFERENCES</b>	<b>66</b>
<b>10</b>	<b>TABLES</b>	<b>102</b>
<b>11</b>	<b>FIGURES</b>	<b>105</b>
<b>12</b>	<b>PLATE</b>	<b>119</b>
<b>13</b>	<b>APPENDICES</b>	<b>122</b>
<b>13.1</b>	<b>INFORMED CONSENT FORM</b>	<b>123</b>
<b>13.2</b>	<b>DEMOGRAPHIC INFORMATION FORM</b>	<b>124</b>
<b>13.3</b>	<b>CALCULATION OF EFFECT SIZE</b>	<b>125</b>
<b>13.4</b>	<b>INTERVENTION DETAILS IAYT</b>	<b>126</b>
<b>13.5</b>	<b>DISABILITY RATING SCALE FOR LOW BACK PAIN</b>	<b>142</b>
<b>13.6</b>	<b>STAI QUESTIONNAIRE (STATE ANXIETY INVENTORY Y-1)</b> <b>STAI – State</b>	<b>144</b>
<b>13.7</b>	<b>BECK DEPRESSION INVENTORY</b>	<b>146</b>

<b>13.8</b>	<b>GENERAL HEALTH QUESTIONNAIRE (GHQ)</b>	<b>151</b>
<b>13.9</b>	<b>NUMERICAL RATING SCALE FOR PAIN</b>	<b>155</b>
<b>13.10</b>	<b>DALLY FOLLOW UP RECORDS</b>	<b>156</b>
<b>13.11</b>	<b>YOGA MODULES FOR LOW BACK PAIN</b>	<b>157</b>
<b>13.12</b>	<b>RAW DATA</b>	<b>171</b>

## CHAPTER-1

### **“REVIEW OF LITERATURE ON SUFFERINGS IN THE FORM OF KLEŚASANTARĀYAS AND VIKṢEPASAHABHUVA AND THEIR REMEDIES ACCORDING TO PATAÑJALİYOGA SŪTRA”**

The details of the empirical work carried out as part of the study entitled “EFFECT OF INTEGRATED APPROACH OF YOGA THERAPY ON BACK PAIN AS MEASURED BY ROLLAND MORRIS DISABILITYINDEX” and the results, key findings, and their implications are discussed in the later sections.

**REMEDIES FOR SUFFERINGS IN THE FORM OF KLEŚASANTARĀYAS  
AND VIKṢEPASAHABHUVA ACCORDING TO PATAÑJALI YOGA**

**SŪTRACONTENT**

1. Introduction

Sufferings and their management according to Patañjali Yoga Sūtra.

- **KLEŚAS**
- **ANTARĀYAS**
- **VIKṢEPASAHABHUVA**

2. Methods to overcome sufferings according Patañjali Yoga Sūtra

- a. Kriyā Yoga for managing Kleśa
- b. Nine ways to overcome Antarāya and Vikṣepasahabuva
- c. Summary and conclusion

References

1. **INTRODUCTION**

Yoga means union and the purpose is to teach the practitioner of Yoga, called the Yogi, how to achieve union or spiritual absorption into the supreme absolute or God. Yoga teaches us that our true self is the soul and that our self-identity is an illusion to be overcome.

There is restlessness everywhere. Selfishness, greed, wrath, lust are havocking. Fights, skirmishes, petty quarrels are polluting the atmosphere and creating discord, disharmony and unrest. Bugle is blown and soldiers are marching in the battlefield to kill their enemies. One nation is waging war against another nation for acquiring more dominions and more powers.

Side by side peace-movement is working silently for bringing concord, harmony and peace, for eradicating the dire ignorance, the root cause for human

sufferings and disseminating Divine Knowledge or knowledge of the Self and infusing devotion into the hearts of people. Mysterious is the universe, still more mysterious is the silent workings of the unseen God, who prompts Rājasik people on one side to wage war and the Sāttvik people on the other side to start Peace Centers for the dissemination of spiritual knowledge and for bringing peace to the suffering humanity at large.

The Goal of life is the attainment of Self-realization or God-consciousness. There is one supreme undying intelligent principle or Essence or Ātman or Brahman or the Supreme Self who dwells in the chambers of our heart. He exists in the past, present and future. He is existence absolute, knowledge absolute and bliss absolute. Ignorant man vainly searches for his happiness and peace in perishable external objects that are conditioned in time, space and causation. He has no peace of mind. His desires are not gratified. He amasses wealth, begets children, gets titles, honors, name, fame and yet his mind is restless. He has no abiding joy and lasting happiness. He is still in want of something. He has no feeling of fullness. This feeling of fullness and eternal satisfaction can be obtained by realizing one's own Self through spiritual Sādhanā, self-restraint, purity and meditation, and by attaining the highest rung in the Yogic ladder.

Peace and happiness can be found only within. We cannot certainly find it in external objects. Wealth, women, children, property, palatial buildings cannot give you the everlasting Peace. We need to look within. We need to realize our oneness with that One Supreme Self, who lives in the chambers of our heart.

When we are established in that, which is an ocean of Peace and Happiness, we will not be shaken even by heavy sorrow, loss or failures, inharmonious and

disagreeable vibrations. We will tide over all difficulties or crises of life very easily and will come back with triumph in all experiences. Mysterious is this Peace! Marvelous is this Peace! Let us realize this Peace that pass all understanding through Yoga Sādhanā and be free. Let us float in this ocean of Peace and rejoice in the Peace of our own Self.

## **1.1 REVIEW OF LITERATURE ON SUFFERINGS IN THE FORM OF KLEŚAS ANTARĀYAS AND VIKṢEPASAHABHUVA AND THEIR REMEDIES ACCORDING TO PATAÑJALI YOGA SŪTRA**

### **1.1.1 CONCEPT OF KLEŚAS**

From the perspective of Yoga is important to understand that emotional pain and its varied expressions, such as depression, stem from the desire, attachment, fear and certain unconscious universal constructs, existing in all unliberated human minds. These constructs form a basis on which all other more individualized neuroses are woven and re-woven through a complex association of desires, attachments, and experiences. If they can be removed through yoga practices, all of the individual neuroses which they support will crumble away. Called Kleśas (or afflictions), these five constructs or crystallized thought-forms are described by Patañjali at the beginning of the Yoga Sutra (1, 2 and 4).

Once they are seen in a clear light they will disappear. The intellectual mind is not enough for this. Yama, Niyama, Āsana, Prāṇāyāma, Pratyāhāra, Dhāraṇā, Dhyāna will lead the mind toward the necessary purification. But every road starts with the first step. Here the Kleśas are to quench the desire of the intellect.

**AVIDYĀ:** is the primal ignorance which pervades all of the creation. This ignorance is experiential, not conceptual, in nature. To individuals, Avidyā means that while the non-dual source of all existence and awareness is pure, all pervasive, immanent, and transcendent, radiating from the core of our being, we do not automatically perceive that this is the case. Our individualized and unpurified sensory mind and the sense organs, because they are relatively crude instruments compared to the subtlety of pure awareness, are incapable of directly perceiving it. Our mind's higher nature (Buddhi) is capable of perceiving the radiant and blissful reflection of the Divine Self, but only when it has been sufficiently purified through persistent practice. For most of us, such purification requires many years of meditation practice, as well as the help of our teachers.

**ASMITA:** As individuals, we also have what is called Ahaṅkāra or "I-maker" (ego). It is a single vritti, or thought form, the idea of individualized existence. This single thought of a limited self is enormously convincing because it pervades the entire body-mind complex. It is the nature of this individual "I-am" sense, or ego, to identify with something and become attached to it. And because we do not easily perceive the existence of the Self, the Ahaṅkāra identifies with some sort of a limited self-concept, usually our body-mind complex, our social identity, our individual attributes of personality or experience, etc. We are born into this world knowing only one thing: This body is mine. But we don't even know who the one who is claiming the body is. The result of this ignorance of our true nature is thus our misidentification with some aspect of limited existence, which is inherently painful because it is incomplete.

Once this misidentification occurs, our whole perception of reality is altered, so that the entire universe is divided into "me" versus "not-me" and the objects of our experience are divided into "mine" and "not-mine". This is Asmita, or "I-ness", the second Kleśa.

**RĀGA:** However, because the identification of Ahaṅkāra was false to begin with, and because what is "me" is relatively small compared to the large surrounding universe mostly composed on "not me", a sort of existential terror and insecurity results. We don't want to face the overwhelming feeling of terror, do we develop various strategies for distracting ourselves from it - for enlarging "me" and for buttressing and preserving our individual and continually threatened small existence. This leads to the third Kleśa, Rāga, attraction, which creates in us a pattern of acquisition: we began to pursue human relationships, knowledge, wealth, status, power-anything which might be capable of enlarging and protecting our fragile individualized existence. But because change is the nature of creation, all objects within it are impermanent, and thus subject to loss at any moment.

**DVEṢA:** In experiencing an object which gives us pleasure, we become attached to that pleasure, and desire to experience it again. When the experience becomes unavailable to us, we feel pain. Our spouse or partner whom we loved and enjoyed leaves us for another. We try to persuade her or him to return, or we try to find another like her or him. If after repeated efforts we are not successful, but our attachment remains strong, our pain and anger turns to depression, helplessness, and finally hatred of ourselves and the world. This is the fourth Kleśa, called Dveśa, "the hate which follows after experiencing the pain."

**ABHINIBHEŚA:** Because of Rāga and Dveṣa, a tremendous, continual, and habitual outflowing of our energy and attention through our senses to the objects of external world has been created. This outflow of all our attention and energy can only increase our identification with our physical existence, making it even harder for us to perceive or identify with our spiritual nature. Not only do we fear death because it represents an ending of our ability to fulfill our desires, but we also emotionally identified with our body-mind complex and thus (at least subconsciously, if not consciously) dear that our existence will terminate with the death of our physical body. This is the fifth Kleśa, Abhinibheśa, the clinging to life, which "dominates even the wise." The Kleśas are imprinted on Citta, the individual consciousness, from time immemorial and create and perpetuate the illusions that existence is limited to the mind-body complex. Even after death the Citta retains the Kleśas in seed form and they sprout to full fruition in the next incarnation. As long as the individual thinks that consciousness is limited to the bodily existence, he is forever in the mercy of forces beyond his control, snatching a little happiness here and there but always aware, even if it is on a subconscious level that sooner or later the body will die and the vehicle of experience will be no more.

Suffering or Duḥkha is a fact of life and afflictions or Kleśas are what cause and perpetuate the cycles of suffering in life. They are the emotional and motivational forces what cause the different states of mind. They are also the obstacles to the practice of yoga undertaken for the purpose of calming the mind. They weaken the ability to maintain the state of total attentiveness that is possible only when the mind is still, in Samādhi.

Such attentiveness is needed since it reduces suffering. It also dissolves the separation between what is perceived and what actually is, the reality of existence.

Patañjali in Sūtra II.3 lists the different afflictions, and these are: ignorance, attachment, ego, aversion and clinging to life and to status quo.

Among these it is ignorance that essentially leads to the other four and those four in turn nurture ignorance. The ignorance, Avidyā, referred to is thinking that the changeable and pain filled self is the real self. One's understanding of the world around does not correspond with reality. The real self that remains un-understood, undiscovered while afflicted, is instead, eternal, free and joyful and one loses sight of that. The four afflictions or Kleśas, other than the Kleśa of ignorance, can be weak or strong at times, may manifest themselves sometime, or may lie dormant and emerge sometimes later. They can be subtle at times. There are impressions that remain latent and sometimes reemerge as thoughts, as words or in the choices that we make, and then they cause suffering.

Sutra II.12 says that at the root of Kleśas are the acts that produce effects, karma, and the effects are experienced in present life and in future lives, in the type of birth, length of life and experiences. Actions leave their imprints on mind; strengthen certain tendencies, while we may not remain aware of their strength. Such imprints, tendencies, called Saṃskāras, increase the likelihood of persistence of certain types of behaviors. Blindly one repeats certain kinds of behaviors, holds on to certain kinds of thoughts. When one becomes aware of the subtlety of Saṃskāras, that knowledge is described as being discriminative. One realizes that the body or the senses is not what one is. The remedy lies in Pratipraśava, meaning re-absorption and is an involuntary process counter to the evolutionary process.

That involuntary process can happen when the mind is tranquil. Nullifying, weakening Kleśas or afflictions that form the obstacles in the path towards attaining tranquil states of mind involves reversing the tendencies, proclivities towards behavior patterns. This is called Pratipraśava, which is turning inwards, melanoma, and not being caught in the flow of happenings in the external world. Gallagher (2009) describes two ways in which we pay attention to or react to what happens around us. There is bottom-up attention that comes from bright colors, hiss of a snake, rotten smell. And there is the top-down attention, which is the active, voluntary focus. Anger, fear and sadness are rooted in the past or the future and have bottom up energy. The better response is to apply the top-down energies, through positive thoughts and feelings. When the affliction is traced to its source, the fire of discriminative thinking, Viveka, burns that source seed taking away its capability to produce more. Tranquility rests within and not without. The practice of Kriyā yoga, that entails maintaining an austere attitude, self-study and having unswerving faith, helps in developing such thinking. Meditation also helps eliminate the effects produced by Kleśas on the mind. There are different levels of meditative absorption, and as the absorption gets deeper and deeper one can reach a level at which one can observe things at their most basic level, in their true essence. This is the realization of reality as it is and not as one perceives it to be.

Patañjali's Sūtra I.24 describes the special person who is free of any afflictions.

**क्लेशकर्मविपाकाशयैरपरामृष्टः पुरुष-विशेष ईश्वरः ॥**

**Kleśakarmavipākāśayairaparāmṛṣṭaḥ puruṣa-viśeṣa īśvaraḥ**

**Explanation:**The Supreme Lord is that special person who is not affected by troubles, actions, developments or by subconscious motivations.

Patañjali describes such a person as Īśvara or God, although not in the sense of one who creates the material universe, but one who is described as being the efficient cause of the world, one who is behind the different forms the world assumes. Īśvara is a special Puruṣa, always unaffected by any afflictions, actions that are caused by them, that lead to consequences or karma and more karma (Karmasaya). Ordinary persons, who have developed discriminative thinking, can come close to such a state through the introspective technique of Kriyā yoga mentioned above and through meditation. When the Saṁskāras are weakened there are no Kleśas. Such a liberated person with the discriminative intelligence becomes a Jīvanamukta, liberated while still in the body. Ignorance loses its hold and one realizes one's self, the true nature. When one is liberated, in a state of Samādhi, one is able to simply witness, and instead of acting in a reactive way, follow the appropriate course of action in a skillful manner.

The portal to deeper levels of awareness, where serenity is experienced, is through calm states of mind, a mind that is free of any fluctuating thoughts. However, it is difficult to arrive at calm states of mind, to quiet thoughts, mainly because of the fivefold obstacles or Kleśas that one faces. The word 'Kleśa' is derived from the root 'klis' which means to afflict, cause pain, and trouble or torment. The Kleśas or obstacles are the reason we keep on going through cycles of changing thought patterns that bring moments of happiness separated by seemingly long stretches of stressful or unhappy states. They are the reason for our misidentifying our real selves with the material world, the body and the conscious

mind. Not realizing our true identity keeps us on the wrong path, away from reaching those deeper levels of awareness, the serene states of mind.

Patañjali's theory regarding the nature of Kleśas, the afflictions that are related to our thought patterns, forms the basic concept in his Aṣṭāṅga Yoga system. There are five different Kleśas or obstacles that are the reason for our changing thoughts. These are our ignorance or Avidyā about the nature of reality, ego or Asmita, likes or Rāga and dislikes or Dveṣa and our misapprehensions and fears about survival or changes, described as Abhiniveśa. Among these five it is the ignorance about the nature of reality that is the most important obstacle since it is also the main reason for the other four obstacles. This ignorance comes from our misidentifying our real selves, the seer, Puruṣa, within us, with our thoughts and experiences, with what is seen. From ignorance come ego, attachments, our likes and dislikes, and our fears of changes. These distracting factors cause us to look at the world from a narrow viewpoint due to feelings of self-importance, filtering our perceptions, and giving us a fragmented picture of reality. And when the fragments become the focus, and the whole is ignored, the result is suffering.

Not all thoughts or experiences cause suffering. We have afflicted thoughts, in the form of desire for power, for possessions; there is ignorance about and apathy towards thinking in a discriminating fashion. And we also have thoughts that are unaffiliated, drawn towards virtue, knowledge and not drawn towards accumulating possessions, for gaining name and fame. Both types of thoughts can exist in latent or in active states; some can be withheld, or can be temporarily blocked from exerting their influence.

The unaffiliated thoughts need to be activated and strengthened more frequently and that requires practice and cultivating dispassion. Different yoga techniques are directed towards this objective.

Kleśas can be attenuated through the reversal of the flow of the usual tendencies of the mind, referred to as Pratipraśava in Patañjali's yoga. It is turning inwards when our natural tendency is to turn outwards as we follow our sense impressions. It is an introspective process. It needs self-discipline and self-study, and both these require perseverance and dedicated effort. It involves monitoring, attending to the negative mind chatter and working at transforming self-damaging thoughts into positive, inspiring ones. By withholding our energy back from negativity, the life force can be channeled into productive or creative activity. Energies directed towards self-examination and through the personal choice of non-interaction selectively undertaken, help self-understanding.

Getting rid of Kleśas or obstacles is difficult and the solution lies in developing a discriminative intelligence that can, with patience, see through the nature of obstacles and thereby prevent them from affecting one's thoughts and actions. Discriminative intelligence depends on the ability to focus attention without any wavering. The ability to withhold distractions develops through practice, through introspective focus whereby one can weaken the hold of past experiences through objective examination of individual, group, societal and cultural influences. We tend to be caught in the details when we need to attend to all sides that shape our understanding.

The consciousness is distributed across diverse areas of influence and recognizing their effectiveness is helpful in learning to dissociate oneself from afflicted ways of thinking. One-pointedness in thinking can be cultivated through meditation and also through practice of postures and regulation of breathing.

These latter two are more than just bodily acts but have psychic correlates. Wilber refers to Prāṇa (life/breath energy) as a form of subtle bio-energy that can be the link between intentional mind and the body.<sup>2</sup> using these techniques as consciousness is progressively unified, and purified, one learn to dissociate oneself from ego driven urges and desires. There are levels of integration, of Samādhi, arrived at through deeper states of meditative focus, that can lead one to realizing one's authentic identity, the real 'seer' or 'Puruṣa' within us.

### 1.1.2 CONCEPT OF ANTARĀYAS

Patañjali Yoga Sūtra Chapter 1 Verse 30

व्याधिस्त्यानसंशयप्रमादालस्याविरतिभ्रान्ति

दर्शनालब्धूमिकत्वानवस्थितत्वानिचित्तविक्षेपास्तेऽन्तरायाः

*Vyādhistyānasa* □ *śayapramādaālasyaaviratibhrāntidarśanaalabdhab*

*hūmikatvaanavasthitatvānicittavik* □ *epa* □ *teantarāyā* □

*Explanation:* These obstacles are disease, idleness, doubt, inattentiveness, lack of energy and proneness to sensuality, mistaken views, not being able to maintain the progress attained, unsteadiness in progression, scattered mental and emotional energy.

### 1.1.3 CONCEPT OF VIKṢEPASAHA BHUVA

Patañjali Yoga Sūtra Chapter 1 Verse

*Duḥkha durmanasya āgame jayato aśvāsapraśvāsā vikṣepasahabh  
uva*

*Explanation: Distress, depression, nervousness and labored breathing are the symptoms of a distracted state of mind.*

### 1.2 REMEDIES FOR SUFFERINGS IN THE FORM OF KLEŚAS ANTARĀYAS AND VIKṢEPASAHA BHUVA ACCORDING TO PATAÑJALI YOGA SŪTRA

- a. Practice of Viveka
- b. Kriyā Yoga for managing Kleśa
- c. Nine ways to overcome Antarāya and Vikṣepasahabh

The banishing of ignorance (Avidyā) regarding reality is needed to overcome the miseries of human life. There is the reality and there are appearances and the aim is to narrow the gap in between. We have a limited control over the world around and it also tends to be temporary. It is difficult to change the world, but it is possible to change the way we look at it.

#### a. VIVEKA

Viveka is discrimination and discretion. It is the ability to discriminate 'between that which is unreal, insubstantial and illusory and what is real, substantial and abiding' (Ajaya, 2008, p. 142). Vigilance, concentration, non-attachment and self-study are some of the tools that help in developing a discerning ability. An emancipated being is one who has reached this state; the

way one perceives life changes for such a person. But until that stage is reached, as said in Sutra II.26, one continues to have afflictions or Kleśas caused by ignorance.

A person with the ability to discriminate, who has Viveka, is aware of the great problems in life and the illusions therein. In life there are things of real value that are permanent and not of passing interest and becoming aware of them are part of our spiritual development. Our worldview is restricted and conditioned by our perceptions and thoughts, turned upside down and distorted. The inability to recognize the difference between real and perceived is the cause of the mind drifting about in different directions, of confusion in life. One finds it difficult to adapt to the ever-changing existential dramas. Whatever understanding one may have developed remains fragmentary, resulting in confusion and conflict.

Discerning intelligence enables one to remain in control, to be able to rein in the mind that is driven and at times limited by Samskāras or life experiences and our nurtured tendencies. When a detached perspective is gained, attachments and desires are exposed and weakened, thereby reducing suffering in life. When our awareness, within the body, and about our feelings and intuitions, is cultivated and we take it deeper within ourselves we get a better understanding of ourselves. It is a spiritual, non-material, non-sensual experience. A new, peaceful way of living evolves.

This deepened awareness is developed through cultivating virtues and eliminating thoughts and activities that cause harm. This means restructuring, reforming our tendencies and purifying actions.

The Kaṭhōpaniṣad (I.2.24) says that desisting from evil ways, keeping the mind tranquil and concentrated is vital towards attaining right knowledge about the self. Being ethical is part of being spiritual.

There is need for a sustained practice, Abhyāsa, of maintaining the attitude of non-reaction, non-attachment or Vairāgya, to sensations, thoughts or feelings as well as material possessions. The discriminating ability or Viveka and Vairāgya (non-reaction) are closely related and they strengthen each other. Together these can progressively lead to weakening and eliminating any karmic experiences and effects. Discriminative intelligence flowing into thoughts, words and acts destroys Avidyā or ignorance about reality that causes pain and suffering. Through the eight practices in Patañjali's Aṣṭāṅga yoga the Sattva energies in the form of serenity and clarity, usually overwhelmed by the drive of rajas or the drag of Tamas energies, are revitalized. The mind becomes free of self-centeredness and self-indulgence. Viveka needs steady focus. With focus one can perceive and comprehend the subtleties in situations. There is intuitive understanding of the situations, of the other participants in one's life and it comes from nurturing the inborn free faculties. Sams (1998) calls this setting up energetic boundaries through using discernment, intuitive sensing of energies directed towards oneself and through the personal choice of non-reaction.

Insightful knowledge grasps the totality of information as one learns to dislodge limitations that are due to our preconceived tendencies and thus enhances the ability to know. It does not mean that one remains immune to pain, and that one can always take a dispassionate attitude in the face of difficult moments in life. There is attentiveness in changing situations.

The past and the future exist in the present moment and reality exists there and dwelling on the moment is the practice of focusing on the present. When one reaches the highest state of Viveka or discrimination, there is nothing that is expected, or to be gained, from the insights, attainments. The dispassion is total and one is liberated while embodied. All the afflictions and all karma are uprooted. The highest virtues rain in effortlessly. The three energies or Guṇas reach a refined level, thereby removing what obscures reality. The luminous or Sattva energy is the ability to discern, the activity oriented rajas energy is free of attachments and the Tamas energy reaches the state of relaxed stillness that does not hinder the contemplative state. Reality can be observed at its most basic level, with its essential qualities, and characteristic properties. It is not seen as a collage of movements, colored by mental patterning, but as distinctively vivid and clear. One lives in total the harmony and order of universe.

It is 'living a physical life with boundless grace, heightened awareness, grounded presence, and compassion while continuing to evolve and serve' (Sams, 1998).

## **b. KRIYĀ YOGA**

Patañjali Yoga Sūtra Chapter 2 Verse 1

**तपः स्वाध्यायेश्वरप्रणिधानानि क्रियायोगः ॥**

***Tapah svādhyāyēśvarapraṇidhānāni kriyāyogaḥ ॥***

*Explanation: Austerity, study of the psyche, profound religious meditation on the Supreme Lord is the dynamic Kriyā yoga practice.*

c. Nine ways to overcome Antarāya and Vikṣepasahabhavaḥ

Patañjali Yoga Sūtra Chapter 1 Verse 32

तत्प्रतिषेधार्थमेकतत्त्वाभ्यासः

*Tatprati□edhārthamekatattvaabhyāsa□*

*Explanation: For the removal of the obstacles, there should be the practice of a standard method used in the pursuit of the reality.*

Patañjali Yoga Sūtra Chapter 1 Verse 33

मैत्रीकरुणामुदितोपेक्षाणांसुखदुःखपुण्यापुण्यविषयाणाम्भावनातश्चित्तप्रसादनम्

*Maitrīkaru□āmuditāupek□a□am*

*Sukhadu□khapu□yaapu□ya*

*Vi□ayā□ā□bhāvanāta□cittaprasādanam*

*Explation: The abstract meditation resulting from the serenity of the mento-emotional energy, comes about by friendliness, compassion, cheerfulness and non-responsiveness to happiness, distress, virtue and vice;*

Patañjali Yoga Sūtra Chapter 1 Verse 34

प्रच्छर्दनविधारणाभ्यांवाप्राणस्य

*Pracchardanavidhāra□ābhyā□vāprā□asya*

*Explanation: Or by regulating the exhalation and inhalation of the vital energy;*

Patañjali Yoga Sūtra Chapter 1 Verse 35

विषयवतीवाप्रवृत्तिरुत्पन्नामनसःस्थितिनिबन्धनी

**Vi□ ayavatīvāprav□ tti□ utpannāmanasa□ sthitinibandhanī**

*Explanation: Or by fusion and steadiness of the mind which is produced by the operation of the mento-emotional energy towards an object which is different to, but similar to a normal thing;*

Patañjali Yoga Sūtra Chapter 1 Verse 36

**विशोकावाज्योतिष्मती**

**Viśokāhvājyoti□ matī**

*Explanation: or by sorrow-less and spiritually-luminous states; Patañjali Yoga Sutra Chapter 1 Verse 37*

**वीतरागविषयंवाचित्तम्**

**Vītarāgavi□ aya□ vācittam**

*Explanation: Or by fixing the men to-emotional energy on someone who is without craving;*

Verse 38

**स्वप्ननिद्राज्ञानालम्बनंवा**

**Śvapnanidrājñānālambana□ vā**

*Explanation: Or by taking recourse to dream or dreamless sleep.*

Verse 39

**यथाभिमतध्यानाद्वा**

**Yathābhimatadhyānātvā**

*Explanation: Or it can be achieved from the effortless linkage of the mind to a higher concentration force which was dearly desired.*

### 1.3 SUMMARY AND CONCLUSION

The Goal of life is the attainment of Self-realization or God-consciousness. There is one supreme undying intelligent principle or Essence or Atman or Brahman or the Supreme Self who dwells in the chambers of our heart. He exists in the past, present and future. He is existence absolute, knowledge absolute and bliss absolute. Ignorant man vainly searches for his happiness and peace in perishable external objects that are conditioned in time, space and causation. He has no peace of mind. His desires are not gratified. He amasses wealth, begets children, gets titles, honors, name, fame and yet his mind is restless. He has no abiding joy and lasting happiness. He is still in want of something.

He has no feeling of fullness. This feeling of fullness and eternal satisfaction can be obtained by realizing one's own Self through spiritual Sādhanā, self-restraint, purity and meditation, and by attaining the highest rung in the Yogic ladder.

## **CHAPTER 2**

# **INTRODUCTION**

## INTRODUCTION

Low back pain is a major clinical and public health problem. Low back pain is a leading cause of disability. It occurs in similar proportions in all cultures, interferes with quality of life and work performance, and is one of the most common reasons for medical consultations (Ehrlich et al, 2003). One per cent of the US population is chronically disabled due to CLBP (Franks JW et al., 1996). Studies on QOL in chronic diseases including CLBP point to factors such as chronicity, seriousness of the episode, stress and depression that reduce the QOL (Andersson GB, 1997). CLBP in women seems to be associated with the lowest quality of life amongst many types of non-malignant chronic pains as was observed in a survey carried out in a multidisciplinary pain clinic in Netherlands (Lamī IE et al., 2005). In CLBP, the reduction in quality of life could be attributed to sleep disturbances, fatigue, and medication abuse (Moldofsky H et al., 1993). Functional disability (Williamas AC et al., 1993) and stress. Amongst these, psychological factors such as depression, anxiety, fear and anger seem to have a greater impact than biomedical or biomechanical factors on CLBP related disability and QOL (Linton SJ, 2000).

Similarly, in patients with fibromyalgia (Verbunt JA et al., 2000) and CLBP(Mason VL et al., 2008) the degree of pain, perceived disability and QOL were influenced more by their mental health status than the degree of physical impairment. Multidisciplinary bio psychosocial rehabilitation has been shown to be better than usual care in improving QOL with reduction in pain and functional disability in patients with chronic back pain (Lang E et al., 2003).Yoga, with its holistic approach to improve overall quality of life, offers several self-regulatory practices that aim at correcting these psychological factors that contribute to low

QOL. An integrated approach to Yoga therapy (IAYT) that includes practices at physical, breathing, mental, intellectual and emotional levels has been shown to be effective in improving the QOL in several chronic conditions such as fibromyalgia, (da Silva et al., 2007).Rheumatoid arthritis (Haslock I, et al., 1994) and cancer (Raghavendra R et al., 2008). Our recent randomized control study on patients with CLBP has shown that an intensive residential short term program of IAYT can reduce the intensity of pain and disability and improve spinal flexibility.(Tekur P et al., 2008).

## **2.1 CLBP and musculoskeletal health.**

There is an association between workplace psychosocial strain and multi-site musculoskeletal pain.(Sembajwe G et al. 2013)A study designed to evaluate the influence of perceived stress and musculoskeletal ache/pain, separately and in combination, at baseline, on self-rated work ability and work performance at two-year follow-up revealed that proactive workplace interventions in order to maintain high work performance and good work ability should include measures to promote musculoskeletal well-being for the employees and measures, both individual and organizational, to minimize the risk of persistent stress reactions. (Lindegrndet al., 2013) Moreover, it is observed that stress among students could be significantly associated with musculoskeletal disorders depending on individuals' demographics, stressors, reactions to stress, and coping methods. Interventions to reduce stress-induced musculoskeletal disorders among students should consider these factors among others (Ekpenyong et al., 2013). There is an association between psychosocial demands and multi-site musculoskeletal pain among patient care associates, nurses, and administrative personnel, both men and women. (Sembajwe et al., 2013) Similarly, persistence of pain is also influenced by adverse beliefs about work causation (Solidaki et. al., 2013) Increase of body weight leads to improper Body Mass Index (BMI) may aggravate work related musculoskeletal discomfort and occupational-psychosocial stress. It was noted that work urgency, accuracy and demands

compel the computer professionals to spend longer hours before computers without giving importance to their health, especially body weight. Increase of body weight leads to improper Body Mass Index (BMI) may aggravate work related musculoskeletal discomfort and occupational-psychosocial stress.

There was a significant effect of BMI in increasing of work related musculoskeletal discomfort and occupational-psychosocial stress among computer workers in a developed ergonomic setup (Sethi J, 2011). Occupational stress is associated significantly with musculoskeletal disorders in lower extremity. (Yu SF, 2011)

## **2.2 CLBP and Epidemiology**

Child agricultural workers suffered from pain especially in the low back that too potato cultivation was strenuous restricting their education. (Das et al., 2013). A study on sixty female prawn seed collectors and 60 female control subjects from Sajenakhali and Sandeshkhali blocks of Sunderbans, West Bengal, India, reveals that female prawn seed collectors suffer from significant physiological load and extreme physiological stress due to prolonged working hours in a standing posture and excessive work pressure. Consequently, all these factors affect female prawn seed collectors' health and work performance. (Das et al., 2012). In one study, it was found that the most commonly affected regions among the skilled and unskilled blacksmith workers were lower back (skilled 65% and unskilled 80%) ( Ghosh et al., 2011). A study by Gangopadhyay S et.al.reported that health of the core-making workers was highly affected by different awkward postures and that they suffer from posture-related musculoskeletal disorders primarily affecting the low back region.(Gangopadhyay et al., 2010).

The stonecutters suffered from discomfort in different parts of their body, specifically in the lower back, knees and shoulders, which mainly prevented them

from continuing their work (Gangopadhyay et al., 2010). A study by Bener et al. revealed that the prevalence of CLBP was 59.2%, comprising 46.1% men and 53.9% women, "Not being able to stop or control worrying" (40.2%), "worrying too much about different things" (40.2%), and "feeling afraid as if something awful might happen" (40.2%) were the most common anxiety symptoms in CLBP patients (Bener et al., 2013). A study undertaken to assess the prevalence and predominant causes of CLBP among peasant farmers in Ebubu community in South-south Nigeria reported that out of the 310 apparently healthy farmers (age range 18-58 years [mean 36.71±8.98]; 132 males) sampled, 208 had CLBP (67.10%). The CLBP was more prevalent in the 31-40 years age group (49.04%), females (50.96%), those who were non-obese (68.95%) or tall (73.2%) and those who had practiced farming for a long duration. Severe CLBP was significantly ( $p < 0.05$ ) linked to aging (51-60 years group) (Birabi et al., 2012). Similarly, in one study by Urquhart DM showed that fifty-six percent of participants reported CLBP in the previous year. When individual psychosocial factors were examined in the same model, the relationship between somatization and LBP persisted. (Urquhart et al., 2013).

Added to that it was reported that high workload was significantly associated with CLBP complaints (Cho et al., 2012).

### **2.3 CLBP Disability**

Established psychological risk factors relate principally to the disability that arises from musculoskeletal pain (Vargas et al., 2013). The patients with nonspecific LBP exhibited a greater disability and worse sleep quality than healthy controls (Iglesias et al., 2013). Working adults with CLBP experience emotional distress, pain beliefs, organizational support, and activity limitation and they need early intervention to recover (Shaw et al., 2013). The CLBP is known to play an

important role in the pathway to becoming work disabled, in particular for award of disability pensions (DP) due to musculoskeletal diagnoses (MSD) (Ropponen et al., 2013).

#### **2.4 CLBP Burden**

A study by Plouvieretal, reported that there is a strong associations between occupational exposures and persistent/recurrent low-back pain in a general working population in France (Plouvler et al., 2010). It was reported that CLBP is a common symptom and an important cause of disease burden in Iran, in particular, in the most productive age for both males and females (Mousavi et al., 2011).

The CLBP is a major cause of morbidity in high-, middle- and low-income countries (Hoy et al., 2010). But the relation between social class and back pain disability cannot be explained solely in terms of manual versus non manual jobs (Hagen et al., 2000). The LBP is one of the top-10 most costly physical health conditions (Goetze et al., 2003). Moreover, LBP is the most prevalent of musculoskeletal conditions; it affects nearly everyone at some point in time and about 4-33% of the population at any given point. Cultural factors greatly influence the prevalence and prognosis of CLBP (Woolf et al., 2003).In Sweden, the indirect costs for chronic CLBP appear to be substantially higher than the direct costs for pharmaceuticals, medical visits, physiotherapy and hospitalizations (Ekman et al., 2005).

#### **2.5Back pain prevalence**

Numerous studies have documented that rate of chronic pain is more in developed western nations. (Jackson et al., 2013).The studies were proven that even the 19% of Orthopedic surgeons are facing lower back pain due to their different postures during the surgery (Davis et al., 2013). The survey on

medical students in a Private Malaysian Medical College says that the Muscular Skeletal Pain MSP is a very regular problem even for the medical students due to their regular routines, and still more research on this is expected. (Alshagga et al., 2013).

The diseases with the largest number of YLDs (Years lived with Disability) in 2010 were low back pain, major depressive disorder, other musculoskeletal disorders, neck pain, and anxiety disorders (US BDC, 2013). The CLBP is a major public health problem, with a considerable impact on workers. (Ramond-Roquin et al., 2013). The most serious occupational musculoskeletal disorders of male steelworkers were waist and neck pain. Personal factors such as age, working years, work load factors such as harmful working postures, manual heavy lifting, and labor organizational factors such as work overtime were the main risk factors of musculoskeletal disorders to the male steelworkers. (Xu L et al., 2013). One of the studies says that the Lower Back Pain is more in nursing staff due to the influence of working methodology at their working places. And more study is need on this. CLBP. (d'Errico et al., 2013). The CLBP is a highly disabling morbidity with high social, economic and individual effects in Brazil. The CLBP prevalence increased from 4.2% to 9.6% in 8 years. (Meucci et al., 2013)

## **2.6 CLBP stress**

The study was to show the prevalence of somatic problems in patients with posttraumatic stress disorders (PTSD). Somatic complaints and diagnosed chronic somatic diseases were present in 184 or 84.8% patients of both sexes.

The highest number of patients had a hypertension, angina pectoris, back pain and degenerative bone diseases, as well as cerebrovascular disease and diabetes (Avdibegovic et al., 2010). To assess whether pre-existing psychiatric diagnoses increase the likelihood of transitioning from sub-acute to chronic back pain. Men (N = 140) experiencing a first onset of low back pain (LBP) were examined for

lifetime psychiatric disorders approximately 8 weeks post pain-onset using the Diagnostic Interview Schedule (DIS-III-R), Men with a pre-pain lifetime diagnosis of major depressive disorder had 5 times greater risk of transitioning to chronic LBP. (Shaw et al., 2010).The demand-control-support "job strain" model is frequently used in occupational health research. We sought to explore the relationship between job strain and back pain. Job strain computed with both psychological and physical demands was strongly and significantly associated with various measures of back pain. Our results support the findings linking back pain to job strain. Moreover, the relationship between back pain and job strain is much stronger if job strain includes both psychological and physical demands (Courvoisier et al., 2011). The study of Back Pain and Stress are focused on three areas: the significance of previous experiences, restrictions in everyday life and restoration of inner resources during the therapy period.

The CLBP is a stress factor in itself but when coupled with depression, they can be regarded as two symptom complexes that mutually affect each other in negative ways. In this study stress seems to become prominent. (Ellegaard et al., 2012).The study examines the impact of work-related psychosocial and mechanical exposure on the development of CLBP in the general working population, In total, 12.8% (861 individuals) reported CLBP during the last month of 2013at follow-up in Norway. (Sterud et al., 2013)

### **2.7 CLBP and financial Burden.**

Patients with CLBP are characterized by greater comorbidity and economic burdens compared with those without CLBP. This economic burden can be attributed to greater prescribing of pain-related medications and increased health resource utilization. Total direct medical costs were estimated at \$8386 ± \$17,507 in

the CLBP group. (Gore et al., 2012). According to the surveys made in US there is 6% of increase in visit for a primary diagnosis of back or neck condition (13.6 Million in 2008). Between 1999 and 2008 the mean annual expenditures on medical care for these patients increased by 95 % (from \$487 to \$950): Most of the increase was accounted for the increased cost for medical specialists, as opposed to primary care physicians. (Davis et al., 2012).

Retrospective Cohort study of health care costs associated with the treatment of chronic low back pain (CLBP) in the United Kingdom was done to assess 12-months health care costs associated with the treatment of CLBP, using the UK General Practice Research Database. Total health care costs for patients with CLBP were double those of the matched controls (£1074 vs. £516). From the total cost the 58.8% was accounted by general practitioner's consultations, 22.3% by referrals to secondary care, and the rest by pain relief medications. (Hong et al., 2013). This survey quantifies the relationship between early retirement due to back problems and wealth, and contributes to a more complete picture of the full costs associated with back problems. The analysis shows the People aged 45-64 years who are out of the labor force due to back problems have significantly less chance of having any accumulated wealth. Of those who have retired early due to back problems who do have some wealth, on average the total value of this wealth is 87% less than the total value of wealth accumulated by those who have remained in full-time employment with no health condition controlling for age, sex and education. (Schofield et al., 2011). This study's objective was to review the literature on the epidemiological and economic burden and treatment of chronic low back pain (CLBP) in France, Germany, Italy, Spain and the UK.

Patients visited general practitioners and osteopaths. Annual direct costs of low back pain were available only for Germany: > euro 7000 per person. (Juniper et al., 2009)

### 2.8 Complementary and Alternative Medicine (CAM) and CLBP

The National Health Interview Survey (NHIS), conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS), U.S in the year 2002 says that Sixty-two percent of adults used some form of CAM therapy during the past 12 months and they found radical reduction in their CLBP. (Barnes et al., 2004). Analysis of health insurance claims from 2 large Washington State companies status that there is a great reduction in the treatment payment for CLBP by using CAM therapy along with conventional methodologies. (Lind et al., 2005)

### 2.9 Yoga and CLBP

According to the study of Department of Family Medicine, Boston University School of Medicine and Boston Medical Center has demonstrated that once-weekly Yoga classes are effective for chronic low back pain. (Saper et al., 2013).

With references to the earlier Yoga programs for outpatients with the residential yogic therapy studies proves that Seven days of **Intensive Residential Yoga Program** reduces pain, anxiety, and depression, and improves spinal mobility in patients with CLBP more effectively than physiotherapy exercises. (Tekur et al., 2012). This systematic review found strong evidence for short-term effectiveness and moderate evidence for long-term effectiveness of Yoga for chronic low back pain in the most important patient-centered outcomes. Yoga can

be recommended as an additional therapy to chronic low back pain patients (Cramer et al., 2013). Yoga has been found effective in the treatment of chronic low back pain. We aimed to evaluate the effectiveness of Iyengar Yoga in chronic neck pain by means of a randomized clinical trial. And it is proved that superior pain relief and functional improvements are happened for the patients who are suffering from CLBP. (Michalsen et al., 2012) The meta-analysis on the effectiveness of Yoga interventions on pain associated disabilities revealed that Yoga can be a supplementary approach for reducing CLBP. (Büssing et al., 2013).The previous studies indicate that 12 weeks of Yoga may be a effective treatment for chronic or recurrent low back pain than the usual care methods. (Tilbrook et al., 2011).

A systematic review conducted on seven databases proves and suggests that Yoga lead to a significantly greater reduction in low back pain than usual care methods.(Posadzki et al., 2011).

## **2.10 Chronic Low Back Pain (CLBP) and Roland-Morris Disability Index (RMDI)**

The RMDI for to CLBP is a validated and popular instrument in clinical practice and research. (Kim et al., 2010) The scores on the RMDI in Yoga (n = 156) or usual care (n = 157) revealed greater improvements in back function than did usual care. (Tilbrook HE et al., 2011). Another study with RMDQ analysis showed that twelve weeks of once-weekly or twice-weekly Yoga classes were similarly effective for predominantly low income minority adults with moderate to severe CLBP. (Saper RB, et al., 2013) A Yoga study intervention with RMDI analysis in a predominantly minority population with CLBP was moderately feasible and may

be more effective than usual care for reducing pain and pain medication use.  
(Saper RB, et al., 2009)

This dissertation builds on the thread suggested above; and explores the IAYT as a potential tool to pain related outcomes and Disability of patients with CLBP using Rolland Morris Disability Index which has not been explored in integrated approach of Yoga Therapy.

The dissertation work is organized as follows:

**CHAPTER 3**

**AIM AND OBJECTIVES**

## AIM AND OBJECTIVES

**3.1 AIM:** To study the scriptures for the basis of stress management in IAYT and to study the effect of integrated yoga-based lifestyle program in a seven days residential set up in patients with CLBP.

To assess the effect of yoga in patients suffering from CLBP

**3.2 OBJECTIVES :**The objective of the present study is to assess the effect of IAYT on in Rolland Morris Disability Questionnaire in patients suffering with CLBP.

### 3.3 RESEARCH QUESTIONS

1. Can we have a model from the traditional references that can suit stress management for present day problems of psychosomatic ailments?
2. Is this model applicable to CLBP?
3. Does this model provide the techniques and practices for a holistic approach to CLBP?
4. Does this offer explanation to understand the possible mechanisms?
5. Can yoga be used to help patients with CLBP within a short-term residential setup without adverse effects?
6. Is yoga effective in reducing pain in patients with CLBP?
7. . Is yoga effective in reducing disability in patients with CLBP?
8. Is yoga effective in reducing anxiety and depression in patients with CLBP?
9. . Can yoga help in increasing spinal flexibility in patients with CLBP?
10. Is an intensive short-term week long yoga treatment effective in dealing with CLBP?

### 3.4 HYPOSTHESIS

The yoga group will report a greater reduction in pain, functional disability, anxiety and depression with better increase in spinal flexibility.

### **3.5 NULL HYPOTHESIS**

The yoga will not show significant changes in pain, functional disability, anxiety and depression and spinal flexibility.

### **3.6 RATIONALE**

Earlier investigations have shown the usefulness of different yoga techniques in reducing pain related outcomes..This study is to further understand the effect of IAYTfor patients suffering from CLBP in enhancing general health assessed through the pre and post measurements of some pain related outcomes including RMDI.

The rationale for the study is that IAYTworks at all levels of human system-physical, mental, emotional, intellectual and spiritual to build a total personality enhancement for general health in the patients suffering CLBP.

**CHAPTER 4**

**METHODS**

**METHODS**

## 4.1 SUBJECTS

The first 35 CLBP patients admitted between April 2013 and June 2013, who satisfied the selection criteria, were recruited as subjects for the study (in all 81 CLBP patients were admitted in this time period).

Sample Size: The sample size was calculated as follows using G power Software. The effect size was calculated by the Cohen formula, using the means and standard deviations of an earlier interventional study on 80 subjects by Tekur P. et. al., 2008. For these calculations we used the noncommercial statistical power analysis program G\*Power (Faul, 2007). The calculations based on the previous study by Tekur P. et. al., 2008 revealed: the mean  $\pm$  SD before for the variable social health was 13.43  $\pm$  3.32 and after the intervention it increased to 14.80  $\pm$  2.71 with a difference of means of 1.37. The Effect Size of that study was 0.60. A sample size of 15 for one arm ( $15 \times 2 = 30$ ) was obtained by feeding this value of 0.60 (from the earlier study) as the effect size, an alpha value of 0.05 powered at 0.70. The sample size that was actually recruited was 35 subjects.

A seven days single group trial in a residential holistic health Centre in Bangalore, India, assigned 35 patients (22 females, 13 male) with CLBP to IAYT. The IAYT program consisted of specific *Asanas* and *Pranayamas* for CLBP, meditation, yogic counseling, and lectures on yoga philosophy. Primary outcomes were change from baseline to 7 days in 24-point RMDI, Pain Analogue Scale (PAN), Symptom Score (SS), Spinal mobility with 'Sit and Reach' instrument (SAR), Straight leg raising test (SLR) using a Goniometer, State-Trait Anxiety Inventory (STAI) form X1 and X2, 24-point Beck Depression Inventory (BDI) and General Health Questionnaire (GHQ- 28). The clinical outcomes were blood

pressure (BP), pulse rate (PR), respiratory rate (RR), breath holding time (BHT) and weight (WT).

#### **4.1.1 INCLUSION CRITERIA**

1. History of CLBP of more than 3 months
2. Pain in lumbar spine with or without radiation to legs (Spitzer et al 2007)
3. Age: 18 to 60 years

#### **4.1.2 EXCLUSION CRITERIA**

1. Organic spinal pathology such as malignancy (primary or secondary), or chronic infection confirmed by X-ray
2. Recommended surgical intervention
3. Severe obesity
4. Critically ill.

#### **4.1.3 SOURCE OF SUBJECTS**

Patients who were admitted to the Yoga therapy residential Health Home (Arogyadhāma) at Prashanti Kutiram, Bangalore

#### **4.1.4 ETHICAL CONSIDERATION**

An informed consent was obtained from all the participants. [Appendix 1]

**The Institutional Review Board (IRB) Approval:** The study was approved by the IRB of SVYASA University.

## **4.2 DESIGN**

single groups pre-post study.

Pre →

→ Post

Subjects	Numbers of Subjects	Age-range	Age in Mean ± SD
Patients suffering from CLBP from health home of S-VYASA university	Males: 13 Females: 22	18 - 60 years	42.11±11.21

### 4.3 INTERVENTION

#### 4.3.1 Theoretical aspect of IAYT

Patañjali defines in his second aphorism 'Yogaścittavṛttinirodhaḥ' (P.Y.S: 1.2) that Yoga is a process of gaining control over the mind by cessation of the modifications of mind. By so controlling the mind one can reach the causal state. 'Tada draṣṭuḥsvarūpeavasthānam' (P.Y.S:1.3). Then the Seer establishes himself in his original state. This technique of 'mind control' prescribed by Patañjali has tools to develop the power of concentration and focusing of mind with increased speed of thoughts and to harness our power to stop all the thoughts in the mind. Another yoga master Vāsiṣṭha emphasizes this aspect by defining yoga as Manapraśmanopāyaḥ yoga ityabhidhīyate || yovā. 3.9.32 || which means Yoga is called a skilful trick to calm down the mind.

#### 4.3.2 Practical aspects of IAYT

There are many methods of yoga catering to the needs of people in all walks of life in society to bring about the transformation of the individual. They are broadly classified into four streams. Swami Vivekananda puts them as work and worship, philosophy and psychic control.

1. Karma Yoga: This path of working in relaxation involves doing action with an attitude of detachment to fruits of action. This makes man release himself from the strong attachments and thereby brings in him a steadiness of mind which verily is Yoga-‘Samatvam Yoga Ucyate’. Instruments of action and understanding (Karmendriyas and Jñānendriyas) get cleansed.
2. Bhakti Yoga: The control of emotions is the key in the path of worship that involves pure love to the Divine and is characterized by total surrender. In this modern world, man is tossed up and down due to emotional onslaughts. The path of Bhakti is a boon to gain control over emotional instabilities by properly harnessing the energy involved in it.
3. Jñāna Yoga: The present age of science has made man a rational being. Intellectual sharpness is imminent. Analysis forms the tool. The path of philosophy (Jñāna Yoga) is apt for the keen intellectuals and is centred on the analysis of ‘happiness’, the vital contribution of Upaniṣads. Also many other fundamental questions regarding the mind, the outside and inside world and the reality are taken up. Basic questions are raised even involving the intellect itself to reach the very basis of intellect.
4. Rāja Yoga: Culturing of mind is the key for success in almost all endeavours in our lives. This Yoga of ‘mind culture or psychic control (Rāja Yoga) gives a practical and easy approach to reach higher states of consciousness. It is based on the Aṣṭāṅga Yoga (Eight limbed yoga consisting of Yama, Niyama, Āsana,

Prāṇāyāma, Pratyāhāra, Dhāraṇā, Dhyāna and Samādhi) of Patañjali's yoga system (Nagendra et al 1998).

## 5. Concept of health and Yoga

According to the World Health Organization (WHO) the state of Health is defined as a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity. The WHO also suggests a fourth dimension spiritual well-being. It is clear from this definition that health and ill-health are not two discrete entities as commonly understood but health should be conceived as a continuous function indicating the state of well-being. In the diagram, the 3rd quadrant 'the region of ill-health' represents what normally we designate as 'Sickness'. Below this, man acts instinctively and is akin to animal man. Coming to the first quadrant, the region of 'Normal Man' the state of normal health is indicated. As he moves along the line further up, he becomes healthier featured by the dormant faculties expressing more vividly in man. This is shown as the region of Superman. In this state, the limitations of normal man namely the strong urges of thirst, hunger, fear and sex are reduced greatly and are fully under control.

Yoga is a systemic conscious process for accelerating the growth of a human being from his animal level and ultimately to divinity. It is a systematic methodology for an all-round personality development-physical, mental, intellectual, emotional and spiritual components-of man. Thus, in its general methodology for the growth of man to divine heights includes techniques useful for therapeutic applications in making man healthier. Yoga is a process for elevating oneself through calming of mind.

Yoga therapy techniques correct the problem from the most fundamental level. The corrections are sought from the innermost causal layer of our existence (Ānandamaya Koṣa or the soul or the master of the system).

A total correction of the bodily disturbances is brought about by correcting the disturbances at the emotional, psychological and the vital energy levels. The integrated approach uses several techniques with a unique aim of reaching a state of silence or calmness of mind or deep relaxation and rest.

Yoga is a method to turn the mind inwards and achieve deep awareness of functions of internal organs. Internal awareness helps to solve one's own internal psychological and emotional conflicts as in psychotherapy.

1. The internal awareness helps to change the learnt conditioning and helps to change the pattern of psychological and physiological responses as in behaviour therapy.
2. Yoga is a technique of unfolding the potential divinity within, so that the dormant capabilities are opened up consciously. Just like in hypnotherapy, every man can tap his dormant capacities or alter his own physiology under the effect of a simple suggestion. Through yoga one does this consciously with self-mastery over such states of consciousness.
3. Yoga corrects the alterations in the Prāṇa flow by slowing down the Prāṇic activity gently and cautiously through conscious, slow, rhythmic breathing.
4. At the physical level, Yogāsanas enhance local relaxation and improves tolerance.
5. Kriyās may help in developing tolerance to external agents, similar to desensitization therapy for allergens.

The concepts to evolve the specific module of 'Integrated approach of Yoga therapy (IAYT) for back pain were taken from traditional yoga scriptures (Patañjali yoga Sūtras, Upaniṣads and Yoga Vāsiṣṭha) that highlight a holistic approach to health management at physical, mental, emotional and intellectual levels (Nagarathna & Nagendra, 2000).

Om meditation: In this meditation the syllable Om is used to achieve a state of alert-full rest (Telles, Nagarathna & Nagendra, 1995). The person seated in any comfortable meditative posture goes on repeating the syllable OM mentally leading to effortless flow of a single thought in the mind (Tatrapratyayaikatānatādhyānam- PYS: 3.2) for ten minutes .

Yoga-based special technique: The yogic physical practices (back pain special techniques, Appendix 1) progressed from initial safe movements to final yoga postures. They included practices (a) to relax the spinal muscles through stretch as in I-5, 6 and by deep rest through breath awareness as in III and conscious guided relaxation of all parts of the body as in VI;

(b) traction effect as in I-1, IV-1, 2, V-1, 2 and 3; (c) strengthening the back muscles as in I-4 and II-1, 2; (d) strengthening the abdominals as in I-1, 2, and 3. Safety of the practices was confirmed by consultation with a senior physiatrist. Special care was taken to avoid acute forward or backward movements and jerky movements of the spine while designing the module (Nagarathna & Nagendra 2001).Yogic hymns: Guided chanting (with meaning) of verses from Bhagavadgītā (the most popular Indian scripture) that describes the definition, and the streams of yoga to arrive the concept of lifestyle change through self-mastery, self-surrender, self-analysis, and awareness in action.

Lectures: These were tailor-made to give the entire philosophical model through self-corrective techniques for healing. They included talks on the yogic approach to health and physiological effects of different yoga practices taught to them. There were talks on the concept of body mind and disease according to yoga, concept of inner core personality as the source of the healer within (*Ānandamaya Koṣa*), concept of how stress is understood in modern science and yogic definition of stress, understanding of how to use introspective correction of the responses to situations and people around, yogic concept of holistic health at physical, mental emotional, social and spiritual levels.

Research done of the physiological effects of different yoga practices that help in the management of back pain. Deep relaxation technique: This is a guided-relaxation technique that lasts for 10 minutes and is done in 3 phases of (i) relaxation from the tip of the toes to the head mentioning each part of the body specifically; (ii) letting the body 'collapse' on the ground with a feeling of 'letting go', chanting OM; (iii) feeling of expansion through visualization of the limitless sky or ocean (Vempati & Telles, 2002).

Prāṇāyāma: Prāṇāyāma is a state of voluntarily regulated breathing while the mind is directed to the flow of breath or Prāṇa. A typical cycle of the slow type Prāṇāyāma breathing involves the phases of inhalation, exhalation; there are different kinds of Prāṇāyāmas varying according to the durations of the phases in the breathing cycles, and the nostrils used. Yogic breathing practices were included to bring about a slow rhythmic breathing pattern to reduce the breath rate with internal awareness of the touch of the flow of air through the air passages, which is an effective way to get mastery over the mind (Nagendra, 2000).

Divine hymns: Divine hymns sessions of singing were meant to replace suppressed emotions and open up the gentle emotions to move towards stress free joyful state of mind.

Since most patients with CLBP have a component of psychological stress, these practices are relevant to correct the problem in a holistic way. Cyclic meditation: This has includes a combination of both stimulating and relaxing or calming practices (Nagendra & Nagarathna 1997) its basis from traditional texts (Chinmayananda, 1984). Studies on this meditation have shown that this technique, which is a combination of yoga postures interspersed with relaxation, reduces arousal more than relaxation alone (Telles, Reddy & Nagendra, 2000).

Yogic counselling: Individual yogic counselling for stress management was focused on 'happiness analyses from an ancient text called Taittirīya Upaniṣad which is similar to the CBT used in modern psychotherapy. This was used to help the patient with LBP to become aware of the emotional responses and restore their freedom to change these responses to chronic pain resulting in stress reduction.

Mind sound resonance technique (MSRT): Perception of the internal resonance of all tissues of the body during prolonged slow chanting of Vedic syllables (a, u, m and Om etc) at very low pitch can help in the achieving a deep meditative state. Repeated practices of these syllables have been incorporated into this thirty-minute practice (Lokeswarananda, 1996).

## **4.4 ASSESSMENTS**

### **4.4.1 24-point RMDI**

The 24-point RMDI, a self-administered questionnaire, developed by Roland MO and Morris RW (Roland MO, Morris RW, 1983) was used to measure the disability. The original version of the Roland Morris Disability Questionnaire was published by Roland and Morris in 1983 (Roland MO, Morris RW, 1983). A review of papers on the questionnaire was published in 2000 (Roland MO, Morris RW, 2000). **Reliability, as estimated by internal consistency, reached a Cronbach alpha of 0.86 for the RMDQ. The calculated test-retest reliability was 0.95 (P < 0.01; n = 20) for the RMDQ. The correlation of the JOA score with RMDQ was -0.568 (P < 0.01).** The RMDI is scored by adding up the number of items checked by the patient. The score can therefore vary from 0 to 24. It is not recommended to give patients a 'Yes' / 'No' option. If patients indicate in any way that an item is not applicable to them, the item is scored 'No', i.e. the denominator remains 24.

#### **4.4.2 Pain Analogue Scale (PAN)**

This is considered to be a simple & reliable tool to measure subjective pain. It consists of a horizontal straight line of 10 centimetres marked on a clean white sheet.

One end of the line marked 0 represents 'No pain' and the other end marked 10 represents 'Worst possible pain'. The subject is asked to indicate his pain by marking a dot on this line.

#### **4.4.3 Symptom Score (SS)**

A symptom check list was prepared for the study and –they were scored on a 4 point scale (0-3).

#### **4.4.4 Spinal mobility with 'Sit and Reach' instrument (SAR)**

The sit-and-reach test was developed to measure hamstring and lower back flexibility and was first described by Wells and Dillon in 1952. To determine criterion-related evidence for the sit-and-reach test as a measure of hamstring and lower back flexibility, test scores must be related to criterion measures. Jackson and Baker 1986 reported a moderate correlation ( $r = .64$ ) between the sit-and-reach test and hamstring flexibility (Lemmink Koen, 2003).

This instrument is used to measure spinal flexibility. The subject sits on the floor with his legs extended towards the Sit and Reach apparatus touching it. He then bends forward to his maximum capacity pushing the indicator with his fingers keeping the elbows remains straight. The distance covered is then measured in centimetres.

#### **4.4.5 Straight leg raising test (SLR) using a Goniometer**

A goniometer (Anand Agencies, Pune) that has two scales fixed at one end to a compass (calibrated in degrees), was used to measure SLR. The patient lies down on his back; the examiner stands on the right side of the couch, the goniometer is placed along the right leg on the couch with the centre of the compass supported firmly. Then the right leg is raised passively without bending the knee until the patient starts getting pain. The outer scale of the goniometer is then moved up along this leg and the angle between the two scales is read on the compass. Same procedure is repeated on the left side by the examiner moving over to the left side of the couch.

#### **4.4.6 State-Trait Anxiety Inventory (STAI) form X1 and X2**

STAI developed by Spiel Berger et al (1970) consists of 2 forms (Y1 and Y2) each comprising of 20 items rated on a 4 point scale. Form Y1 assesses state anxiety, defined as 'a transitory emotional state that varies in intensity, fluctuates over time and is characterized by feelings of tension and apprehension and by heightened activity of the autonomic nervous system' (Spielberger, 1970). It evaluates how the respondents feel right now at this moment. Form Y2 evaluates trait anxiety, which is 'a relatively stable individual predisposition to respond to situations perceived as threatening' (Spielberger, 1970). The overall median alpha co-efficient is 0.92 and the tool has adequate concurrent, convergent, divergent and construct validity (Spielberger et al; 1970). It has been extensively used in the Indian context and found to be useful.

#### **4.4.7 24-point Back Depression Inventory (BDI)**

This 21 item inventory devised by (Beck et al, 1961) measures cognitive, affective and vegetative symptoms of depression. It assesses severity of both symptoms and attitudes specific to depressed individuals. The score for each item ranges from 0-3 and the range of total score is 0-63. A score between;

1. 0-9: No depression
2. 10-19: Mild depression
3. 20-25: Moderate depression
4. 26 +: Severe depression.

Reliability co- efficient for the BDI include correlation between each item and the total score ranging from 0.31- 0.68, and split half reliability ranging from 0.86 – 0.93 (Beck, 1988).

#### **4.4.8 General Health Questionnaire (GHQ- 28)**

General Health Questionnaire - 28 (GHQ) used to ascertain health status.

The (GHQ) is invented by Goldberg to assess the psychiatric morbidity in general practice, is a self-administered questionnaire. It has 28 questions with four different sub scales to assess the physical fitness, anxiety and insomnia, social dysfunction and depression. It gave the information about recent mental status, it identifying the how much psychiatric disturbance the person has. The questioner has acceptable psychometrics and has intimate consistency and reliability with Cranach's alpha of 0.85 and validity of 0.76. [12] (Cut-off value > 7). And reliability with Cronbach's alpha of 0.85 and validity of 0.76. (Goldberg & Hillier, 1979)

#### **4.4.9 Blood pressure (BP)mm of Hg**

B.P was measured daily in the afternoon at 3 pm by the same therapist on the right arm in sitting position using a mercury sphygmomanometer (Diamond Company, India).

#### **4.4.10 Pulse rate (PR)Beats per minutes**

The number of beats per minute of the pulse was noted manually at the radial artery of the right hand by using a stopwatch while the person was in sitting position.

#### **4.4.11 Respiratory rate (RR)**

The resting respiration rate (RR cycle per minutes) was noted by visual observation of the respiratory movements of the abdomen or the chest wall while the participant was seated. To ensure that the RR was recorded when the person was not aware of his breathing; the therapist was trained to note the RR by visual observation while he continued to keep the fingers on the radial artery so that the participant's attention could be diverted.

#### **4.4.12 Breath holding time (BHT in seconds):)**

The Bhrāmarī time measurement was designed to get a clinical measure of the ability of the person to prolong the expiratory rate on effort similar to slow vital capacity. Yoga texts indicate that voluntary slowing down of the rate of breathing and exhalation time are important indicators of the ability of the person to reduce the perturbations of the mind. ( Calevātecalechittam– Haṭha Yoga Pradīpikā- If the mind moves the breath moves and vice versa). This is similar to what is known in modern science today that RR, PR and BP are simple but direct indicators of the state of autonomic arousal. Hence the Bhrāmarī time measurement was designed to get a measure of the exhalation time. Participant was asked to sit comfortably, take a deep breath in and start breathing out slowly to produce a low pitched humming sound (called Bhrāmarī in yoga)

as long as long as he/ she can. The duration of this chanting was measured using a stop watch. The mean of the three consecutive attempts was noted as BHT in seconds.

#### **4.4.13 Weight (WT)**

It was measured in Kilogram by using the same weighing instrument on day one and day seven.

## CHAPTER 5

# DATA EXTRACTION AND ANALYSIS

DATA EXTRACTION AND ANALYSIS

The data were analyzed by the statistician using Statistical Package for Social Sciences version 16.0 for PC Windows 2007. Shapiro-Wilk test to check normality of baseline data, Paired Samples Test to check and compare the means within and between groups were used.

## **CHAPTER 6**

# **RESULTS**

## **RESULTS**

All patients reported better sleep, sense of well-being and confidence after the program. There were no adverse side effects. There was significant improvement in all the variables.

**RMDI:** The analysis showed 54.13% decrease in RMDI scores ( $P<0.001$ )

**PAS:** The PAS showed 86.20% decrease ( $P<0.001$ )

**SS:** There were 75% decrease in SS ( $P<0.001$ )

**SAR:** 41.96% increase in SAR score ( $P<0.001$ )

**SLR RT:** 40.57% increase in right SLR score ( $P<0.001$ )

SLR LT: 34.55% increase in left SLR score ( $P<0.001$ )

**STAI:** 40.10% decrease in STAI score ( $P<0.001$ )

STA2: 38.82% decrease in STAI score ( $P<0.001$ )

**BDI:** 69.90% decrease in BDI score ( $P<0.001$ )

**GHQ:**GHQ score showed 87.76% decrease ( $P<0.001$ ) in somatic symptoms(SS), 89.29% decrease ( $P<0.001$ ) in anxiety and insomnia(AI), 86.96% decrease ( $P<0.001$ ) in social dysfunction(SF), 84.75% decrease ( $P<0.001$ ) in severe depression (SD)84.75% and decrease ( $P<0.001$ ) medical complaints.

**BP:** 6.94% decrease in Systolic BP ( $P<0.001$ ), 7.5% decrease in Diastolic BP ( $P<0.001$ )

**PR:** 7.01% decrease in PR ( $P<0.001$ )

**RR:** 18.7% decrease in RR ( $P<0.001$ )

**BHT:** 40.57% increase in BHT ( $P<0.001$ )

**WT:** 1.8 % decrease in WT ( $P<0.001$ )

## CHAPTER 7

# DISCUSSION

DISCUSSION

This was a one week long pre-post study on 35 patients with CLBP. Results showed significant ( $P < 0.01$ , Paired Samples Test) improvements in all the variables. The discussions on each of these variables presented below includes effect of one week intervention, comparisons with normative values where available and comparisons with earlier studies.

1. RMDI scores ( $P < 0.001$ ): Significant reduction RMDI scores in the present study was consistent with the previous study. Vini yoga was used in CLBP (Sherman et al., 2005) on an outpatient basis which has shown about 37% reduction at 6th week, 60% at 12 weeks and 62% at the end of 26 weeks as assessed by RMDI. In another study using Iyengar yoga (Williams et al., 2005) a 77% reduction in functional disability was found after 12 weeks. The present study has shown 54.13% reduction within 1 week.
2. PAS: The analysis of PAS showed 86.20% decrease ( $P < 0.001$ ) after seven day IAYT practice which is consistent with previous reports on IAYT (Groessler et al. 2008). This would have resulted in reversal of the biochemical processes and opened up the connective tissue plasticity (Langevin, et al 2007).

The significant reduction in pain scale in the present study may be related to the fact that the patients were able to relax their body completely, slow down the breath resulted in enhancing in peace of mind. This may allow them to be a witness to a pain and eventually in the process of continues practice of healing yoga practices they may be able to feel the minimizing of the intensity of pain.

3. SS: In our study we have observed that there were 75% decrease in SS ( $P < 0.001$ ) which is consistent and comparable with the previous study of 66% improvement in SS within two weeks (Pradhan, et al., 2008) and improvement

in energy/fatigue by 32% (Groessler, et al., 2008). In the earlier well planned 3-armed- randomized control study on Vini yoga, back-related functions and symptom bother sameness were superior in the yoga group compared to the self-care book and exercise groups after 12 and 26 weeks of intervention; no objective measures were used in the study. It is to be noted that in our study the medication score was nil before and after which also may be the factor in bringing very well result in the SS.

4. SAR: In the present study there was 41.96% significant increase in SAR score ( $P < 0.001$ ) which shows that there was increase in body flexibility due to yogic practices. It may be possible that they were able to feel reduction in their pain intensity.

These results are similar to Galantino's Iyengar yoga study of three months which showed 64 % improvement. The two week's results of Pradhan's study shows a 34.29% improvement.

5. Left and right SLR score: In the present study it was observed that there was 34.55%. 40.57% increase in both left SLR (SLRL) and right SLR (SLRR) score ( $P < 0.001$ ) which is consistent with the previous reports. (Pradhan et al., 2009, Tekur p et al., 2008)

The results of Iyengar yoga showed significant reduction in pain and functional disability, after 16 and 32 weeks of yoga (3 classes per week), with no significant improvement in the degree of spinal flexibility. The present study although of only 7 days' duration showed significant changes not only in pain and disability but also in the objective measures of spinal flexibility.

6. STAI :and STA2 In the present study it revealed that there was 40.10%, 38.82% decrease in STAI and STA2 score ( $P < 0.001$ ) after the practice of IAYT for seven days.

In trait anxiety tests, subjects are asked to indicate how they felt 'most of the time' during the preceding week i.e. before they came for the intervention on the first day and on the 7th day after the yoga practice.

These results, showing that the Yoga intervention consistently produced significant improvement in seven days IAYT may seem interesting. Trait anxiety was designed as a robust construct to measure slow underlying anxiety changes over weeks and months. In this context, the validity of ascribing changes to a one week intervention period may sound questionable. However, in a previous short term (9 day) yoga study (3-4 hours/ day in an outpatient setup) Gupta et al (2006) observed reductions in trait anxiety in patients with chronic disease. Thus, the improvement in trait anxiety in the present study, may be considered evidence for the yoga intervention's power to reduce deep-rooted stress.

It is commonplace among those who teach and practice yoga that even a 30 minute, carefully practiced session of Āsanas and Prāṇāyāma transforms how they feel internally. That a week of intensive programs of this kind, morning, noon and night, should have effects even on deep and apparently ineradicable levels of anxiety, does not seem so implausible. The significance of this transformation may be compared to that of well substantiated changes in the emotionality variable as a result of regular Transcendental Meditation practice, something in which EPI author, HA Eysenck, he took great interest when it was

discovered (Abrams 1990). Both emotionality and Trait anxiety are considered long term, stable properties of the personality.

In both cases, deep Yoga-based programs have indicated that they may not be as permanent as was originally supposed.

Two earlier randomized control studies of yoga for back pain, (Sherman et al., 2005, Williams et al., 2005) have also found reduction in pain and increased spinal mobility. However, that significant reductions in scores on state and trait anxiety, and depression scales, can also be produced in such a short intensive inpatient yoga program, seems to be a unique finding of this study. These results may stem from the fact that IAYT incorporates many stress-management components like stimulation, relaxation, slowing of breath etc.

7. BDI: In the present study there was 69.90% decrease in BDI score ( $P < 0.001$ ) which is consistent and comparable with many previous reports as given below:

Feyer, et al., (2000) showed that a history of pre-existing psychological distress influenced recurrent episodes of LBP. Yoga intervention for 10 weeks showed favorable changes in Energy/ fatigue (32%), Depression (27%), Physical Health Scale (5%) and Mental Health Scale (12%) in patients with CLBP (Groessler et al., 2008).

They showed that increased levels of psychological distress (as measured by the GHQ) preceded the occurrence of new episodes of pain by only short intervening periods, implying a role for acute distress in the onset of the disorder. In the study, by Pradhan et al there were significant decreases in anxiety and insomnia (AI) symptoms by 59%, and severe depression (SD) by 45% in GHQ after two weeks of intervention in CLBP patients. Sharma R et al. (2008) in a study which included both healthy volunteers and patients found a remarkable improvement in the subjective well-being scores.

Although no other RCT yoga study has found significant improvements on psychological components of CLBP (Galantino et al, 2004), a number of non-yoga studies of cognitive behavioral therapy (CBT), pharmacotherapy, aerobics, physical therapies etc. have observed that improvement in pain and disability in CLBP patients may be accompanied by reduction in anxiety and depression (Koldas et al., 2008). Goubert et al. (2005) observed correlations between somatic and physical function subscales of BDI with dysfunctional cognitions related to CLBP. These were a reflection of how their CLBP was interfering with their daily life.

Thus, yoga seems to provide the feeling of wellness that could both be the cause and the effect of the improvement in pain and flexibility.

8. GHQ score showed 87.76% decrease ( $P < 0.001$ ) in somatic symptoms(SS), 89.29% decrease ( $P < 0.001$ ) in anxiety and insomnia(AI), 86.96% decrease ( $P < 0.001$ ) in social dysfunction(SF), 84.75% decrease ( $P < 0.001$ ) in severe depression (SD)84.75% and decrease ( $P < 0.001$ ) medical complaints.

These results are consistent with the previous report by Ganpat TS in which he has been shown that short duration of yoga practice can bring improvement in health. He showed that there was 68.25% decrease ( $P < 0.001$ ) in somatic symptoms, 66.29% decrease ( $P < 0.001$ ) in anxiety and insomnia, 65.00% decrease ( $P < 0.001$ ) in social dysfunction, 87.08% decrease ( $P < 0.001$ ) in severe depression, and 71.47% decrease ( $P < 0.001$ ) in all medical complaints which was the result of five days yoga based self-management of excessive program in managers.

9. BP: In the present study there was 6.94% decrease in Systolic BP ( $P < 0.001$ ) and 7.5% decrease in Diastolic BP ( $P < 0.001$ ). The stress management through yoga practices such as relaxation techniques (Sarang et al, 2006), Prāṇāyāma

(Raghuraj et al., 1998; Telles et al., 1994) and meditation (Telles et al., 1995) with effective reduction in sympathetic activation and improved autonomic stability have been seen by many earlier control studies in normal volunteers.

There are also studies that have used different types of yoga and relaxation techniques in lifestyle related diseases that have shown significant improvement in autonomic variables. Autogenic training, progressive muscle relaxation, visualization and breathing exercises, chi gong and yoga are appropriate relaxation techniques which occupy a permanent place in effective antihypertensive treatment (Schwickert et al, 2006).

Immediate effect of reduction in BP after single sessions of exercise, relaxation and the enhancing effect of their combination in both non-hypertensive and hypertensive subjects has been demonstrated (Santaella et al.,2006).

In a study on Yoga in 13 patients with essential hypertension, aged 41–60 years, BP dropped significantly during the third week of a 4-week yoga program (1 h per day, 6 days per week), and it fell further after the program. The systolic BP dropped from 142 to 128 mm Hg by the third week and to 121 mmHg by the fourth week (Vijayalakshmi et al, 2004). Thus, we can conclude that even a short duration of yoga practice may decrease the BP significantly and if the yoga practice continued for long time may result in effective control in BP modulation.

10. PR: In the present study there was 7.01% decrease in PR ( $P < 0.001$ ) which is good sign improvement in cardiac function leading low metabolic rate and relaxation of the whole body and mind complex. This result is consistent with

the previous study in which there was improvement in PR after one week of intervention in tsunami-affected population. The intervention was given one month after the December 2004 tsunami in Andaman Island where the affected people were living in camps. After one week of yoga program a significant decrease was found in self-rated fear, anxiety, sadness, disturbed sleep and their heart and breath rate (Telles et al, 2007).

11. RR: In the present study we have observed that there was 18.7% decrease in RR ( $P < 0.001$ ). This is direct sign of enhancing in the calm state of the mind. No doubt the present finding is consistent with the previous studies (Telles et al, 2007), it should be noted that our scripture also confirm that if the RR slow down, and there will be effect of calming of mind (Hatha Yoga Pradipika Chapter II- 2).
12. BHT: In the present study it was observed that there was 40.57% increase in BHT ( $P < 0.001$ ) which is the indication of enhancing the lung capacity in patients with CLBP. These results are consistent with the previous study by Tekur P (Tekur P et al., 2008).
13. WT: In the present study it was observed that there was 1.8 % decrease in WT ( $P < 0.001$ ). The decrease in WT in the patients with CLBP is a sign of improvement in their health and is consistent with the previous report in which there was significant reduction in weight after the practice of IAYT (Tekur P et al., 2008).

## CHAPTER 8

# CONCLUSION

### CONCLUSION

#### 8.0. CONCLUSION

The seven days intensive residential IAYT program reduces pain, anxiety, depression and improves spinal mobility and general health in patients with CLBP. Additional randomized control trials are needed before a strong recommendation can be made.

### **8.1 IMPLICATION OF THE STUDY**

Previous studies on IAYT reported enhanced general health as a result of the practice of Yoga. (Tekur P et al., 2008) Our study is consistent with these findings, indicating that a systematic adoption of the IAYT program can result in improvement of general health.

### **8.2 STRENGTH OF THE STUDY**

In the present study we have used RMDI which was not used before in yoga for CLBP in a residential set up.

### **8.3 LIMITATION OF THE STUDY**

The duration of the study was only for seven days and the sample size was small (n=35).

### **8.4 SUGGETIONS FOR THE FUTURE STUDY**

1. Future studies should be done in CLBP with bigger sample size and randomized control trial.
2. Long-duration of the intervention to assess long term impact of IAYT.

### **8.5 THE HOPE AND THE FUTURE PERSPECTIVE**

It may be hoped that the different health centers may review the available literature on yoga and may incorporate IAYT in their therapy for enhancing general health of the patients suffering from CLBP.

## CHAPTER 9

# REFERENCES

## REFERENCES

- Abrams AI. A follow-up study on the effects of the Transcendental Meditation program on inmates at Folsom State Prison. Paper 280, 2108-2112. In: Chalmers R, Clements G, Schenkluhn H, Weinless M. (eds) Scientific Research on Maharishi's Transcendental Meditation and TM-Sidhi Programme Collected Papers Vol. 3, Vlodrop: MERU Press, 1990
- Ajaya Swami, 2008. Healing the Whole Person: Applications of Yoga Psychotherapy. Himalayan Institute Press, Honesdale PA, 179 p.
- Alshagga MA, Nimer AR, Yan LP, Ibrahim IA, Al-Ghamdi SS, Radman Al-Dubai SA. Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian Medical College. BMC Res Notes. 2013 Jul 1;6(1):244.
- Alshagga MA, Nimer AR, Yan LP, Ibrahim IA, Al-Ghamdi SS, Radman Al-Dubai SA. Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian Medical College. BMC Res Notes. 2013 Jul 1;6(1):244. [Epub ahead of print]
- Available from: <http://well.blogs.nytimes.com/2011/01/28/how-meditation-may-change-the-brain/>. Cited on August 14, 2013.
- Available from: <http://www.physics.udel.edu/~bnikolic/klesa.html>. Cited on Aug 14, 2013.
- Avdibegovic E, Delic A, Hadzibeganovic K, Selimbasic Z. Somatic diseases in patients with posttraumatic stress disorder. Med Arh. 2010;64(3):154-7.
- Andersson GBJ. (1997). The epidemiology of spinal disorders. In: J.W. Fry Moyer (Ed) The Adult Spine: Principles and Practice. 2<sup>nd</sup> edition. (pp. 93-141), Philadelphia: Lippincot-Raven.

- Ann-Christin Johansson, Michael Cornefjord, Leif Bergkvist, John O' hrvik, Steven J. Linton. Psychosocial stress factors among patients with lumbar disc herniation, scheduled for disc surgery in comparison with patients scheduled for arthroscopic knee surgery. *Eur Spine J* (2007) 16:961–970.
- Asmundson GJG,& Norton GR. (1995). Anxiety sensitivity in patients with physically unexplained chronic back pain: Preliminary report. *Behaviour Research and Therapy* 33, 771-777.
- Astin JA. (1998). Why patients use alternative medicine: results of a national study. *JAMA*, 279(19), 1548-1553.
- Barnes PM, Powell-Griner E, McFann K, Nahin RL Complementary and alternative medicine use among adults: United States, 2002. *Adv Data*. 2004 May 27;(343):1-19
- Baldwin ML. Reducing the costs of work-related musculoskeletal disorders: targeting strategies to chronic disability cases:*J Electromyogr Kinesiol*. 2004 Feb; 14(1):33-41.
- Bantick SJ, Wise RG, Ploghaus A, Clare S, Smith SM, Tracey I (2002) Imaging how attention modulates pain in humans using functional MRI. *Brain* 125 , 310–319.
- Barnard JA, Lyons RM, Moses HL. The cell biology of transforming growth factor beta. *Biochem Biophys Acta* 1990;1032:79-87.
- Barrett B, Marchand L, Scheder J, Appelbaum D, Plane MB, Blustein J, et al.(2004). What complementary and alternative medicine practitioners say about health and health care.*Ann FamMed*, 2(3), 253-259.
- Basler HD, Jakie C, Kroner-Herwig B. Incorporation of cognitive-behavior treatment into the medical care of chronic low back pain patients: a controlled

randomised study in German pain treatment centers. *Patient Education and Counseling* 1997; 31: 113-124.

- Bener A, Verjee M, Dafeeah EE, Falah O, Al-Juhaishi T, Schlogl J, Sedeeq A, Khan S. Psychological factors: anxiety, depression, and somatization symptoms in low back pain patients. *J Pain Res* 2013;6:95-101
- Birabi BN, Dienye PO, NdukwuGU. Prevalence of low back pain among peasant farmers in a rural community in South South Nigeria. *Rural Remote Health* 2012;12:1920.
- Bijlani RL, Vempati RP, Yadav RK, Ray RB, Gupta V, Sharma R, Mehta N, Mahapatra SC. A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus. *J Altern Complement Med* 2005; 11(2): 267-274.
- Borenstein DG. (2001). Epidemiology, etiology, diagnostic evaluation, and treatment of low back pain. *Curr Opin Rheumatol*, 13(2), 128-134.
- Büssing A, Ostermann T, Lüdtker R, Michalsen A. Effects of yoga interventions on pain and pain-associated disability: a meta-analysis. *J Pain*. 2012 Jan;13(1):1-9. doi: 10.1016/j.jpain.2011.10.001. Epub 2011 Dec 16.
- Braverman DL, Ericken JJ, Shah RV, & Franklin DJ. (2003). Interventions in chronic pain management. 3. New frontiers in pain management: complementary techniques. *Arch Phys Med Rehabil*, 84 (3 Suppl 1), S45-49.
- Brown RP, Gerbarg PL. Sudarshan Kriya Yogic breathing in the treatment of stress, anxiety, and depression. Part II--clinical applications and guidelines. *J Altern Complement Med* 2005; 11(4): 711-717.
- Burdorf A, & Sorock G. (1997). Positive and negative evidence of risk factors for back disorders. *Scand J Work Environ Health*, 23(4), 243-256.

- Carey TS, Garrett, JM, & Jackman AM. (2000). Beyond the good prognosis. Examination of an inception cohort of patients with CLBP. *Spine*, 25, 115-20.
- Carmody J BRA. Relationships between mindfulness practice and levels of mindfulness, medical and psychological symptoms and well-being in a mindfulness-based stress reduction program. *J Behav Med* 2008; 31:23-33.
- Carragee EJ, Alamin TF, Miller JL, & Carragee JM. (2005). Discographic, MRI and psychosocial determinants of low back pain disability and remission: a prospective study in subjects with benign persistent back pain. *Spine J*: 5, 24-35.
- Carver A. Pain. In: Dale DC, Federman DD, eds. *ACP Medicine*. New York, NY: WebMD; 2005:1-18.
- Chattha R, Raghuram N, Venkatram P, Hongasandra NR. Treating the climacteric symptoms in Indian women with an integrated approach to yoga therapy: a randomized control study. *Menopause*. 2008;15:862-70.
- Chattha R, Nagarathna R, Padmalatha V, Nagendra HR. Effect of yoga on cognitive functions in climacteric syndrome: a randomised control study. *BJOG*. 2008;115:991-1000.
- Chinmayānanda S. *Mandukya Upaniṣad*. Bombay: Sachin Publishers. 1984.
- Cho CY, Hwang YS, Cherng RJ. Musculoskeletal symptoms and associated risk factors among office workers with high workload computer use. *J Manipulative Physiol Ther* 2012;35(7).
- Chaya MS, Kurupad AV, Nagendra HR, Nagaratna R. (2006). The effect of long term combinationed yoga practice on the basal metabolic rate of healthy adults. *BMC Complementary and Alternative Medicine*, 6: 28.

- Cherkin DC, Eisenberg D, Sherman KJ, Barlow W, Kaptchuk TJ, Street J, et al. (2001). Randomized trial comparing traditional Chinese medical acupuncture, therapeutic massage, and self-care education for chronic low back pain. *Arch Intern Med*, 161(8), 1081-1088.
- Childs JD, Fritz JM, Flynn TW, Irrgang JJ, Johnson KK, Majkowski GR, et al. (2004). A clinical prediction rule to identify patients with low back pain most likely to benefit from spinal manipulation: a validation study. *Ann Intern Med*: 141(12), 920-928.
- Chinmayānanda S. *Mandukya Upaniṣad*. Bombay: Sachin Publishers. 1984.
- Clays E, De Bacquer D, Leynen F, Kornitzer M, Kittel F, & De Backer G. (2007). The impact of psychosocial factors on low back pain: longitudinal results from the Belstress study. *Spine*:32, 262-268.
- Courvoisier DS, Genevay S, Cedraschi C, Bessire N, Griesser-Delacretaz AC, Monnin D, Perneger TV. Job strain, work characteristics and back pain: a study in a university hospital. *Eur J Pain*. 2011 Jul;15(6):634-40. doi: 10.1016/j.ejpain.2010.11.012. Epub 2010 Dec 24.
- Cramer H, Lauche R, Haller H, Dobos G. A systematic review and meta-analysis of yoga for low back pain. *Clin J Pain*. 2013 May;29(5):450-60. doi: 10.1097/AJP.0b013e31825e1492. Campbell A. *Beating back pain*. London: Mitchell Beazley, 2-4 Heron Quays. 2004.
- Coghill R, Sang C, Maisog J, Iadorola M (1999) Pain intensity processing within the human brain: a bilateral, distributed mechanism. *J Neurophysiol*82, 1934–1943.

- Coghill RC, McHaffie JG, Yen YF (2003) Neural correlates of interindividual differences in the subjective experience of pain. *Proc Natl Acad Sci USA*100, 8538–8542.
- Cohen S, Kamarck T, Mermelstein R A global measure of perceived stress. *J Health Soc Behav* 1983; 24:385-96.
- Cohen L, Warneke C, Fouladi RT, Rodriguez MA, Chaoul-Reich A, Psychological adjustment and sleep quality in a randomized trial of effects of a Tibetan yoga intervention in patients with lymphoma. *Cancer* 2004;100:2253-60.
- Craig AD (2002) How do you feel? Interoception: the sense of the physiological condition of the body. *Nat Rev Neurosci*3, 655–666.
- Critchley HD, Wiens S, Rotshtein P, Ohman A, Dolan RJ (2004) Neural systems supporting interoceptive awareness. *Nat Neurosci*7, 189–195.
- Das B, Ghosh T, Gangopadhyay S. Assessment of ergonomic and occupational health-related problems among female prawn seed collectors of Sunderbans, West Bengal, India. *Int J OccupSafErgon.* 2012;18(4):531-40
- Das B, Ghosh T, Gangopadhyay S. Child Work in Agriculture in West Bengal, India: Assessment of Musculoskeletal Disorders and Occupational Health Problems. *J Occup Health.* 2013 Jun 7. [In Press]
- Davis WT, Sathiyakumar V, Jahangir AA, Obremskey WT, Sethi MK. Occupational injury among orthopaedic surgeons. *J Bone Joint Surg Am.* 2013 Aug 7;95(15):e1071-6. doi: 10.2106/JBJS.L.01427.
- Davis MA, Onega T, Weeks WB, Lurie JD. Where the United States spends its spine dollars: expenditures on different ambulatory services for the

management of back and neck conditions. *Spine (Phila Pa 1976)*. 2012 Sep 1;37(19):1693-701. doi: 10.1097/BRS.0b013e3182541f45.

- David Borsook, Eric A Moulton<sup>1</sup>, Karl F Schmidt and Lino R Becerra. Neuroimaging revolutionizes therapeutic approaches to chronic pain. *Molecular Pain*2007, 3:25.
- da Silva GD, Lorenzi-Filho G, Lage LV. Effects of yoga and the addition of Tui Na in patients with fibromyalgia. *J Altern Complement Med*. 2007;13:1107–13
- Danhauer SC, Tooze JA, Farmer DF, et al. Restorative yoga for women with ovarian or breast cancer: findings from a pilot study. *J Soc Integr Oncol* 2008; 6:47-58.
- Deshpande S. Influence of Yoga on Quality of Life a Randomised Control Study [PhD, Thesis]. Bengaluru: Swami Vivekananda Yoga University; 2007.
- Deyo RA, Mirza SK, & Martin BI. (2006). Back pain prevalence and visit rates: estimates from U.S. national surveys, 2002. *Spine*, 31(23), 2724-2727.
- d'Errico A, Viotti S, Baratti A, Mottura B, Barocelli AP, Tagna M, Sgambelluri B, Battaglino P, Converso D. Low Back Pain and Associated Presenteeism Among Hospital Nursing Staff. *J Occup Health*. 2013 Jun 24. [Epub ahead of print].
- Donald R Murphy and Eric L Hurwitz. A theoretical model for the development of a diagnosis-based clinical decision rule for the management of patients with spinal pain. *BMC Musculoskeletal Disorders*2007, 8:75.
- Ehrlich GE. Low back pain. *Bull World Health Organ*. 2003; 81(9):671-6.
- Eisenberg DM, Kessler RC, Van Rompay MI, Kaptchuk TJ, Wilkey SA, Appel S, et al. (2001).

Perceptions about complementary therapies relative to conventional therapies among adults who use both: results from a national survey. *Ann Intern Med*: 135, 344-351.

- Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Rompay M, et al. (1998). Trends in alternative medicine use in the United States, 1990-1997: results of a follow-up national survey. *JAMA*, 280 (18), 1569-1575.
- Eisenberg DM, Kessler RC, Foster C, Norlock FE, Calkins DR, & Delbanco TL. (1993). Unconventional medicine in the United States. Prevalence, costs, and patterns of use. *N Engl J Med*, 328(4), 246-252.
- Ekpenyong CE, Daniel NE, Aribio EO Associations between academic stressors, reaction Health Sci 2013;23(2):98-112. to stress, coping strategies and musculoskeletal disorders among college students. *Ethiop J*
- Ekman M, Johnell O, Lidgren L . (2005). The economic cost of low back pain in Sweden in 2001: *Acta Orthop*. 2005 Apr; 76(2):275-84.
- Ellegaard H, Pedersen BD. Stress is dominant in patients with depression and chronic low back pain. A qualitative study of psychotherapeutic interventions for patients with non-specific low back pain of 3-12 months' duration. *BMC MusculoskeletDisord*. 2012 Sep 6;13:166. doi: 10.1186/1471-2474-13-166. Ehrlich GE. Low back pain. *Bull World Health Organ*. 2003; 81(9):671-6.
- Engel L, Andersen LB. (2000). Effects of body-mind training and relaxation stretching on persons with chronic toxic encephalopathy. *Patient Education and Counseling*, 39, 155-161.
- Ernst E, Musculoskeletal conditions and complementary/alternative medicine. *Best Pract Res Clin Rheumatol*. 2004 Aug; 18(4):539-56.

- Faul F, Erdfelder E, Lang A-G, Buchner A. G\*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Method* 2007;39: 175-191. Free G\*Power 3 software available at: <http://franz-faul-uni-kiel-germany.software.informer.com>.
- Fanian H, Ghassemi GR, Jourkar M, Mallik S, Mousavi MR. Psychological profile of Iranian patients with low-back pain. *East Mediterr Health J* 2007;13:335-46.
- Fernandez E,& Turk DC. (1995). The scope and significance of anger in the experience of chronic pain. *Pain*, 61, 165-175
- Feyer AM, Herbison P, Williamson AM, de Silva I, Mandryk J, Hendrie L, Hely MC. The role of physical and psychological factors in occupational low back pain: a prospective cohort study. [Occup Environ Med](#). 2000;57(2):116-20.
- Fishman L, Ardman C. *Back Pain: How to Relieve Low Back Pain & Sciatica*. New York, NY: W.W. Norton & Co.; 1997.
- Fleming S, Rabago DP, Mundt MP, & Fleming MF. (2007). CAM therapies among primary care patients using opioid therapy for chronic pain. *BMC Complement Altern Med*, 7, 15.
- Franks JW, Kerr MS, Brooker AS, Demano SE. Disability resulting from occupational low back pain: A review of scientific evidence on prevention before disability begins. *Spine*. 1996;21:2908–17. Fairbank JC, Pynsent PB. The Oswestry Disability Index. *Spine* 2000; 25(22): 2940-2952.
- Franks JW, Kerr M S, Brooker AS, Demano S E. (1996). Disability resulting from occupational low back pain. A review of scientific evidence on prevention before disability begins. *Spine*, 21, 2908-17.

- Friedman R, Sobel D, Myers P, Caudill M, & Benson H. (1995). Behavioural medicine, clinical health psychology, and cost offset. *Health Psychol*, 14(6), 509-518.
- Fritz JM, George SZ & Delitto A. (2001). The role of fear-avoidance beliefs in acute low back pain: relationships with current and future disability and work status. *Pain*, 94, 7-15.
- Fryer G, Morris T, Gibbons P, Paraspinal muscles and intervertebral dysfunction: part one. *J Manipulative Physiol Ther*. 2004 May; 27(4):267-74.
- Frymoyer JW. Back pain and sciatica. *N Engl J Med*. 1988; 318:291-300.
- Galantino ML, Bzdewka TM, Eissler-Russo JL., Holbrook ML, Mogck EP, Geigle P, Farrar JT, The impact of modified Hatha yoga on chronic low back pain: a pilot study. *Altern Ther Health Med*. 2004 Mar-Apr; 10(2):56-9.
- Gallagher Winifred, 2009. *Rapt: Attention and the Focused Life*. The Penguin Group, New York, NY, 244 p.
- Gangopadhyay S, Ghosh T, Das T, Ghoshal G, Das B. Effect of working posture on occurrence of musculoskeletal disorders among the sand core making workers of West Bengal. *Cent Eur J Public Health* 2010;18(1):38-42.
- Gangopadhyay S, Das B, Das T, Ghoshal G, Ghosh T. An ergonomics study on posture-related discomfort and occupational-related disorders among stonecutters of West Bengal, India. *Int J OccupSafErgon* 2010;16(1):69-79.
- Garfinkel MM, Singhal A, Katz WA, Allan DA, Reshetar R. Schumacher Jr. HR Yoga based intervention for carpal tunnel syndrome: a randomized trial. *J Am Med Assoc* 1998; 280:1601-3.
- Ghosh T, Das B, Gangopadhyay S. A comparative ergonomic study of work-related upper extremity musculo skeletal disorder among the unskilled and

skilled surgical blacksmiths in West Bengal, India. *Indian J Occup Environ Med* 2011;15(3):127-32.

- Gore M, Sadosky A, Stacey BR, Tai KS, Leslie D. The burden of chronic low back pain: clinical comorbidities, treatment patterns, and health care costs in usual care settings. *Spine (Phila Pa 1976)*. 2012 May 15;37(11):E668-77. doi: 10.1097/BRS.0b013e318241e5de.
- Goetzel RZ, Hawkins K, Ozminkowski RJ, Wang S. The health and productivity cost burden of the "top 10" physical and mental health conditions affecting six large U.S. employers in 1999. *J Occup Environ Med* 2003;45(1):5-14
- Goubert L, Crombez G, Danneels L. The reluctance to generalize corrective experiences in chronic low back pain patients: a questionnaire study of dysfunctional cognitions. *Behav Res Ther*. 2005; 43:1055-67.
- Groessl EJ, Weingar KR, Aschbacher K, Pada L, & Baxi S. (Yoga for veterans with chronic low-back pain. *J Altern Complement Med*, 2008; 14, 1123-1129.
- Gupta N, Khera S, Vempati RP, Sharma R, Bijlani RL. Effect of yoga based lifestyle intervention on state and trait anxiety. [Indian J Physiol Pharmacol](#). 2006 ;50(1):41-7.
- Guzman J, Esmail R, Karjalainen K, Malmivaara A, Irvin E, & Bombardier C. (2002). Multidisciplinary bio-psycho-social rehabilitation for chronic low back pain. *Cochrane Database Syst Rev*(1), CD000963.
- Hagen KB, Holte HH, Tambs K, Bjerkedal T. Socioeconomic factors and disability retirement from back pain: a 1983-1993 population-based prospective study in Norway. *Spine (Phila Pa 1976)* 2000 25(19):2480-7. .
- Haidt Jonathan, 2006. *The Happiness Hypothesis: Finding Modern Truth in Ancient Wisdom*. Basic Books, Persus Books Group, New York, NY, 297 p.

- Hartranft Chip, 2003. *The Yoga Sutra of Patanjali: A New Translation with Commentary*. Shambhala Classics, Boston, and London. 149 p.
- Haslock I, Monro R, Nagarathna R, Nagendra HR, Raghuram NV. Measuring the effects of yoga in rheumatoid arthritis. *Br J Rheumatol*. 1994;33:787–8.
- Hong J, Reed C, Novick D, Happich M. Costs associated with treatment of chronic low back pain: an analysis of the UK General Practice Research Database. *Spine (Phila Pa 1976)*. 2013 Jan 1;38(1):75-82. doi: 10.1097/BRS.0b013e318276450f.
- Hoy D, March L, Brooks P, Woolf A, Blyth F, Vos T, Buchbinder R. Measuring the global burden of low back pain. *Best Pract Res Clin Rheumatol* 2010;24(2):155-65. (Hoy et al., 2010) Haslock I, Monro R, Nagarathna R, Nagendra HR, Raghuram NV. Measuring the effects of yoga in rheumatoid arthritis. *Br J Rheumatol* 1994;33(8): 787-788.
- Hayden JA, van Tulder MW, Malmivaara AV, & Koes BW. (2005). Meta-analysis: exercise therapy for nonspecific low back pain. *Ann Intern Med*, 142(9), 765-775.
- Hayden JA, van Tulder MW, & Tomlinson, G. (2005). Systematic review: strategies for using exercise therapy to improve outcomes in chronic low back pain. *Ann Intern Med*, 142(9), 776-785.
- Hazard RG, Haugh LD, Reid S, Preble JB, & MacDonald L. (1996). Early prediction of chronic disability after occupational low back injury. *Spine*, 21, 945- 951.
- Herr KA, Mobily PR, & Smith C. (1993). Depression and the experience of chronic back pain: A study of related variables and age differences. *The Clinical Journal of Pain*, 9, 104-114.

- Hoffman BM, Papas RK, Chatkoff DK, & Kerns RD. (2007). Meta-analysis of psychological interventions for chronic low back pain. *Health Psychol*, 26(1), 1-9.
- Hoogendoorn WE, van Poppel MN, Bongers PM, Koes BW, & Bouter LM. (1999). Physical load during work and leisure time as risk factors for back pain. *Scand J Work Environ Health*: 25, 387-403.
- Hoogendoorn WE, van Poppel MN. Bongers PM. Koes BW, & Bouter LM. (2000). Systematic review of psychosocial factors at work and private life as risk factors for back pain. *Spine*: 25, 2114-2125.
- Hudspith MJ, Siddall PJ, Munglani R. Physiology of pain. In: Hemming HC, Hopkins PM, eds. *Foundations of Anesthesia*. 2nd ed. London, UK: Mosby; 2006:267-285.
- Hunt TK, Banda MJ, Silver IA. Cell interactions in posttraumatic fibrosis. *Ciba Found Symp* 1985;114:127-49.
- Iyengar, B.K.S., 2005. *Light on Life: The Yoga Journey to Wholeness, Inner Peace and Ultimate Freedom*. Rodale, 282 p
- Iglesias-González JJ, Muñoz-García MT, Rodrigues-de-Souza DP, Albuquerque-Sendín F, Fernández-de-Las-Peñas C. Myofascial Trigger Points, Pain, Disability, and Sleep Quality in Patients with Chronic Nonspecific Low Back Pain. *Pain Med* 2013
- Jackson T, Chen H, Iezzi T, Yee M, Chen F. Prevalence and Correlates of Chronic Pain in a Random Population Study of Adults in Chongqing, China. *Clin J Pain*. 2013 Jul 24. [Epub ahead of print]
- Jonathan Brooks and Irene Tracey. From nociception to pain perception: imaging the spinal and supraspinal pathways. *J. Anat.*(2005)207:19–33.

- Juniper M, Le TK, Mlads D. The epidemiology, economic burden, and pharmacological treatment of chronic low back pain in France, Germany, Italy, Spain and the UK: a literature-based review. *Expert OpinPharmacother*. 2009 Nov;10(16):2581-92. doi: 10.1517/14656560903304063.
- John PJ, Sharma N, Sharma CM, Kankane A. Effectiveness of yoga therapy in the treatment of migraine without aura: a randomized controlled trial. *Headache* 2007; 47:654-61.
- Kabat-Zinn Jon, 2005. *Coming to Our Senses*. Hyperion, New York, 631 p.
- Kaptchuk TJ,& Eisenberg DM. (1998). The persuasive appeal of alternative medicine. *Ann Intern Med*, 129(12), 1061-1065.
- Katz RT. (2006). Impairment and disability rating in low back pain. *Clin OccupEnviron Med*: 5, 719-740.
- Kessler RC, Davis RB, Foster DF, Van Rompay MI, Walters EE, Wilkey SA, et al. (2001). Long-term trends in the use of complementary and alternative medical therapies in the United States. *Ann Intern Med*, 135 , 262-268.
- Kiecolt-Glaser JK, Mc Guire L, Robles TF, & Glaser R. (2002). Psychoneuroimmunology and psychosomatic medicine: back to the future. *Psychosom Med*: 64:15-28.
- Kim TS, Pae CU, Hong CK, Kim JJ, Lee CU, Lee SJ, et al. Interrelationships among pain, disability, and psychological factors in young Korean conscripts with lumbar disc herniation. *Mil Med*. 2006;171:1113-6.
- Kim M, Guilfoyle MR, Seeley HM, Laing RJ. A modified Roland-Morris disability scale for the assessment of sciatica. *ActaNeurochir (Wien)* 2010;152(9):1549-53; discussion 1553.

- Kjaer TW, Bertelsen C, Piccini P, Brooks D, Alving J, & Lou HC. (2002). Increased dopamine tone during meditation-induced change of consciousness. *Brain Research Cognitive Brain Research*, 13, 255-259.
- Koldas Dogan S, Sonel Tur B, Kurtais Y, Atay M B. Comparison of three different approaches in the treatment of chronic low back pain. *Clin Rheumatol*. 2008; 11.
- [Krantz G](#), [Forsman M](#), [Lundberg U](#). Consistency in physiological stress responses and electromyographic activity during induced stress exposure in women and men. [Integr Physiol Behav Sci](#). 2004;39:105-18.
- Krisanaprakornkit T, Krisanaprakornkit W, Piyavhatkul N, Laopaiboon M. Meditation therapy for anxiety disorders. *Cochrane Database Syst Rev* 2006;25:CD004998.
- Kwon MA, Shim WS, Kim MH, Gwak MS, Hahm TS, Kim GS, et al. (2006). A correlation between low back pain and associated factors: a study involving 772 patients who had undergone general physical examination. *J Korean Med Sci*, 21, 1086-1091.
- Lang E, Liebig K, Kastner S, Neundörfer B, Heuschmann P. Multidisciplinary rehabilitation versus usual care for chronic low back pain in the community: Effects on quality of life. *Spine J*. 2003;3:270-6
- Langevin HM, Sherman KJ. Pathophysiological model for chronic low back pain integrating connective tissue and nervous system mechanisms. *Med Hypotheses* 2007; 68:74-80.
- Lamī IE, Peters ML, Vlaeyen JW, Kleef Mv, Patijn J. Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. *Eur J Pain*. 2005 Feb;9(1):15-24

- Lamī IE, Peters ML, Vlaeyen JW, Kleef Mv, Patijn J. Quality of life in chronic pain is more associated with beliefs about pain, than with pain intensity. *Eur J Pain*. 2005 Feb;9(1):15-24
- Leask A, Abraham DJ. TGF-beta signaling and the fibrotic response. *FASEB J* 2004;18:816-27.
- Leboeuf-Yde C, Kyvik KO, & Bruun NH. (1999). Low back pain and lifestyle. Part II--Obesity. Information from a population-based sample of 29,424 twin subjects. *Spine*, 24(8), 779-783; discussion 783-774.
- Lemmink Koen APM, Kemper Han CG, de Greef Mathieu HG. Rispens Piet, Stevens Martin. The validity of the sit-and-reach test and the modified sit-and-reach test in middle-aged to older men and women (Measurement and Evaluation). *Research Quarterly for Exercise and Sport* 2003. Online.
- Linton SJ. A review of psychological risk factors in back and neck pain. *Spine*. 2000; 25, 1149-1156.
- Lind BK, Lafferty WE, Tyree PT, Sherman KJ, Deyo RA, Cherkin DC. The role of alternative medical providers for the outpatient treatment of insured patients with back pain. *Spine (Phila Pa 1976)*. 2005 Jun 15;30(12):1454-9.
- Lindegård A, Larsman P, Hadzibajramovic E, Ahlborg G Jr. The influence of perceived stress and musculoskeletal pain on work performance and work ability in Swedish health care workers. *Int Arch Occup Environ Health* 2013. [In Press]
- Lipchik GL, Milles K, Covington EC. The effects of multidisciplinary pain management treatment on locus of control and pain beliefs in chronic non-terminal pain. *The Clinical Journal of Pain* 1993; 9:49-57.

- Liddle SD, Baxter GD, & Gracey JH. (2004). Exercise and chronic low back pain: what works? *Pain*, 107, 176-190.
- Longe SE, Wise R, Bantick S, et al. (2001) Counter-stimulatory effects on pain perception and processing are significantly altered by attention: an fMRI study. *Neuroreport* 12, 2021–2025.
- Lou HC, Kjaer TW, Friberg L, Wildschiodtz G, Holm S & Nowak MA. (1999). A 150 – H2O PET study of meditation and the resting state of normal consciousness. *Human Brain Mapping*, 7, 98-105.
- Lundberg U. Psychological stress and musculoskeletal disorders: psychobiological mechanisms. Lack of rest and recovery greater problem than workload. *Lakartidningen*. 2003;100:1892-5.
- Madan I, Reading I, Palmer K T, Coggon D. Cultural differences in musculoskeletal symptoms and differences. *International Journal of Epidemiology*. 2008;37:1181-9.
- Manjunath NK, Telles S . Influence of yoga and ayurveda on self rated sleep in a geriatric population. *Indian Journal of Medical Research* 2005; 121:683-690.
- Manchanda SC, Narang R, Reddy KS, Sachdeva U, Prabhakaran D. Dharmanand S, Rajani M, Bijlani R. (2000). Retardation of coronary atherosclerosis.
- Marras WS, Lavender SA, Leurgans SE, Fathallah FA, Ferguson SA, Allread WG, et al. (1995). Biomechanical risk factors for occupationally related low back disorders. *Ergonomics*, 38, 377-410.
- Mason VL, Mathias B, Skevington SM. Accepting low back pain: Is it related to a good quality of life? *Clin J Pain*.2008;24:22-9

- Mehling WE, Hamel KA, Acree M, Byl N, Hecht FM, Randomized, controlled trial of breath therapy for patients with chronic low-back pain. *Altern Ther Health Med.* 2005; 11:44-52.
- Meucci RD, Fassa AG, Paniz VM, Silva MC, Wegman DH. Increase of chronic low back pain prevalence in a medium-sized city of southern Brazil. *BMC MusculoskeletDisord.* 2013 May 1;14:155. doi: 10.1186/1471-2474-14-155.
- Mc Cracken LM ,& Gross R T (1995). The Pain Anxiety Symptom Scale (PASS) and the assessment of emotional response to pain. In L. Vandecreek, S. Knapp and T.L. Jackson (Eds.): *Innovations in clinical practice - A sourcebook*, Vol. 14 (pp. 309-21). Florida: Professional Resources Press.
- Melzack R, Wall PD. Pain mechanisms: a new theory. *Science.* 1965; 150:971-979.
- Michalsen A, Grossman P, Acil A, Langhorst J, Lütke R, Esch T, et al. Rapid stress reduction and anxiolysis among distressed women as a consequence of a three-month intensive yoga program. *Med Sci Monit* 2005; 11:555-561.
- Michalsen A, Traiteur H, Lütke R, Brunnhuber S, Meier L, Jeitler M, Büssing A, Kessler C. Yoga for chronic neck pain: a pilot randomized controlled clinical trial. *J Pain.* 2012 Nov;13(11):1122-30. doi: 10.1016/j.jpain.2012.08.004.
- Miller RJ & Hafner R J. (1993). Medical visits and psychological disturbances in chronic low back pain. *Psychosomatics*, 32, 299-316.
- Miller JJ, Fletcher K, Kabat-Zinn J. Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders. *Gen Hosp Psychiatry* 1995; 17:192-200.

- Moldofsky H, Lue F A. Disordered sleep, pain, fatigue and gastrointestinal symptoms in fibromyalgia, chronic fatigue and irritable bowel syndromes. New York: Elsevier Science Publishers; 1993
- Monro R, Powar J, Nagarathna R, Dandona P. 1992. Yoga therapy for NIDDM- a control trial. J Complemen Med Res: 6:66-68.
- Moldofsky H, Lue F A. Disordered sleep, pain, fatigue and gastrointestinal symptoms in fibromyalgia, chronic fatigue and irritable bowel syndromes. New York: Elsevier Science Publishers; 1993.
- Mousavi SJ, Akbari ME, Mehdian H, Mobini B, Montazeri A, Akbarnia B, Parnianpour M. Low back pain in Iran: a growing need to adapt and implement evidence-based practice in developing countries. Spine (Phila Pa 1976) 2011;36(10):E638-46.
- Mutrie N, Campbell AM, Whyte F, et al. Benefits of supervised group exercise programme for women being treated for early stage breast cancer: pragmatic randomized controlled trial. BMJ 2007; 337:517.
- Murugesan R, Govindarajulu N, Bera T K. Effect of selected yogic practices on the management of hypertension. Indian J Physiol Pharmacol 2000; 44:207-10.
- Nagendra HR, Nagarathna R. New Perspectives in Stress Management. Bangalore: Vivek?nanda Kendra Prakashana. 1997.
- Nagaratna R, Nagendra H R, Crisan H G, Seethalakshmi R. Yoga in Anxiety Neurosis - A scientific study. In: Proceedings of the International Symposium of the Royal College of Physicians and Surgeons of Glasgow-update Medicine and Surgery. 1988;.192-196.
- Nagarathna, Nagendra H.R. (2001). Yoga for Back Pain. Bangalore: Swami Vivekānanda Yoga Prakashana.

- Nagarathna R, Nagendra H R. Yoga for the promotion of positive health. Bangalore: Swami Vivekānanda Yoga Prakashana. 2000.
- Nagarathna R, Nagendra. H R. Yoga for bronchial asthma: a controlled study. British Medical Journal (Clin Rer Ed) 1985; 291: 1077-9.
- Naga Venkatesha Murthy PJ, Janakiramaiah N, Gangadhar BN, & Subbukrishna DK. (1998). P300 amplitude and antidepressant response to Sudarśan Kriya Yoga (SKY). Journal of Affective Disorders, 50, 45-48.
- Nagendra HR. Mind Sound Resonance Technique. Bangalore. Swami Vivekānanda Yoga Prakashana. 1998.
- Nagendra HR. Prāñāyāma . The Art and Science. Bangalore: Swami Vivekānanda Yoga Prakashana. 2000.
- Nagendra HR, Nagarathna R. New Perspectives in Stress Management. Bangalore: Vivekānanda Kendra Prakashana. 1997.
- Nahit ES, Hunt IM, Lunt M, Dunn G, Silman AJ, & Macfarlane GJ. (2003). Effects of psychosocial and individual psychological factors on the onset of musculoskeletal pain: common and site-specific effects. Ann Rheum Dis, 62, 755- 760.
- Narendran S, Nagarathna R, Gunasheela S, Nagendra HR. Efficacy of yoga in pregnant women with abnormal Doppler study of umbilical and uterine arteries. J Indian Med Assoc. 2005;103:12-4, 16-7.
- Narendran S, Nagarathna R, Narendran V, Gunasheela S, Nagendra HR. Efficacy of yoga on pregnancy outcome J Altern Complement Med. 2005: 2:237-44.
- National Pharmaceutical Council and Joint Commission on Accreditation of Healthcare Organizations. Pain: Current Understanding of Assessment,

Management, and Treatments. Reston, VA: National Pharmaceutical Council; 2001.

- Naveen KV, Nagarathna R, Nagendra HR, Telles. Yoga breathing through a particular nostril increases spatial memory scores without lateralized effects. *Psychological Reports* 1997; 81:555-561.
- Nespor K. Psychosomatics of back pain and the use of yoga. *Int J Psychosom.* 1989; 36(1-4):72-8.
- Nisargadatta Maharaj, with Maurice Frydman and Sudhakar S. Dikshit, 1973. *I Am That: Talks with Sri Nisargadatta Maharaj.* The Acorn Press, Durham, North Carolina, 550 p
- Oken BS, Kishiyama, Zajdel D, Bourdette D, Carlsen J, Haas M, Hugos C, Kraemer D F, Lawrence J, Mass M. Randomized controlled trial of yoga and exercise in multiple sclerosis. *Neurology* 2004; 62:2058-64.
- Ornish D, Scherwitz LW, Billings JH, Brown SE, Gould KL, Merritt TA, Sparler S, Armstrong WT, Ports TA, Kirkeeide RL, Hogeboom C, Brand RJ. (1998). Intensive lifestyle changes for reversal of coronary heart disease. *JAMA.*; 280:2001-2007.
- Ostelo RW, van Tulder MW, Vlaeyen JW, Linton SJ, Morley SJ, & Assendelft WJ. (2005). Behavioural treatment for chronic low-back pain. *Cochrane Database Syst Rev*(1), CD002014.
- Padmashree G. Immediate Effect of Yogic Relaxation on Frontalis Surface EMG. [M.Sc, Thesis]. Bengaluru: Swami Vivekananda Yoga University; 2007.
- Padmashree G and Shirley Telles. Frontalis EMG Amplitude Changes During Yoga Relaxation Based on Initial Levels. *Journal of Indian Psychology.* 2005: 25.16-23.

- Papageorgiou AC, Macfarlane GJ, Thomas E, Croft PR, Jayson MI, & Silman AJ. (1997). Psychosocial factors in the workplace--do they predict new episodes of low back pain? Evidence from the South Manchester Back Pain Study. *Spine*, 22, 1137-1142.
- Patanjala Yoga Sutra. Available from: <http://www.rainbowbody.net/HeartMind/ystoc.htm>. Cited on Aug 12, 2013.
- Petrovic P, Petersson KM, Ghatan PH, Stone-Elander S, Ingvar M (2000) Pain-related cerebral activation is altered by a distracting cognitive task. *Pain*85, 19–30.
- Ploghaus A, Tracey I, Gati J, et al. (1999) Dissociating pain from its anticipation in the human brain. *Science* 284, 1979–81.
- Plouvier S, Gourmelen J, Chastang JF, Lanon JL, Niedhammer I, Leclerc A. Personal and occupational factors associated with low-back pain in a general working population in France. *Rev EpidemiolSantePublique*. 2010 ;58(6). (Plouvler et al., 2010)
- Ploghaus A, Narain C, Beckmann CF, et al. (2001) Exacerbation of pain by anxiety is associated with activity in a hippocampal network. *J Neurosci*21, 9896–9903.
- Posadzki P, Ernst E. Yoga for low back pain: a systematic review of randomized clinical trials. *ClinRheumatol*. 2011 Sep;30(9):1257-62. doi: 10.1007/s10067-011-1764-8. Epub 2011 May 18.
- Porro CA, Baraldi P, Pagnoni G, et al. (2002) Does anticipation of pain affect cortical nociceptive systems? *J Neurosci*22, 3206–3214.

- Pradhan B. Effect of integrated approach of yoga therapy for back pain. [Doctrate in Hindu Studies, Thesis] Orlando, Florida, USA: Hindu University of America; 2009.
- Punset Eduardo, 2007. The Happiness Trap. Chelsea Green Publishing Co., White River Junction, VT, 160 p.
- Punnett L, Prüss-Utūn A, Nelson DI, Fingerhut MA, Leigh J, Tak S, Phillips S. Estimating the global burden of low back pain attributable to combined occupational exposures. *Am J Ind Med.* 2005 Dec;48(6):459-69.
- Raghuraj P, Ramakrishna AG, Nagendra HR, Shirley T. Effect of two selected yogic breathing techniques on heart rate variability. *Indian Journal of Physiology and Pharmacology* 1998; 42:467-472.
- Raghavendra R, Nagendra HR, Nagarathna R, Vinay C, Chandrashekara S, Gopinath KS, et al. Influence of yoga on mood states, distress, quality of life and immune outcomes in early stage breast cancer patients undergoing surgery. *Int J Yoga.* 2008;1:6-6.
- Ramond-Roquin A, Bodin J, Serazin C, Parot-Schinkel E, Ha C, Richard I, Petit Le Manach A, Fouquet N, Roquelaure Y. Biomechanical constraints remain major risk factors for low back pain. Results from a prospective cohort study in French male employees. *Spine J.* 2013 Jul 12. pii: S1529-9430(13)00556-1. doi: 10.1016/j.spinee.2013.05.040. [Epub ahead of print].
- Rao RM, Telles S, Nagendra HR, Nagarathna R, Gopinath K, Srinath S, Chandrashekara C. Effects of yoga on natural killer cell counts in early breast cancer patients undergoing conventional treatment. *Med Sci Monit.* 2008;LE3-4.

- Rao MR, Raghuram N, Nagendra HR, Gopinath KS, Srinath BS, Diwakar RB, Patil S, Bilimagga SR, Rao N, Varambally S. Anxiolytic effects of a yoga program in early breast cancer patients undergoing conventional treatment: a randomized controlled trial. *Complement Ther Med.* 2009;17:1-8.
- Ricard Matthieu, 2006. *Happiness: A Guide to Developing Life's Most Important Skill.* Translated by Jesse Browner, Little Brown and Co., New York. 281 p.
- Rissin D, Melin B, Sandsjö L, Dohns I, Lundberg U. Surface EMG and psychophysiological stress reactions in women during repetitive work. *Eur J Appl Physiol.* 2000 Oct;83:215-22.
- Rodríguez-García J, Sánchez-Gastaldo A, Ibáñez-Campos T, Vázquez-Sousa C, Cantador-Hornero M, Expósito-Tirado JA, Cayuela-Domínguez A, Echevarría-Ruiz de Vargas C. Related factors with the failed surgery of herniated lumbar disc. *Neurocirugia (Astur).* 2005; 16(6): 507-517.
- Ropponen A, Svedberg P, Kalso E, Koskenvuo M, Silventoinen K, Kaprio J. A prospective twin cohort study of disability pensions due to musculoskeletal diagnoses in relation to stability and change in pain. *Pain* 2013
- Roland MO, Morris RW. A study of the natural history of back pain. Part 1: Development of a reliable and sensitive measure of disability in low back pain. *Spine* 1983; 8: 141-144.
- Saper RB, Boah AR, Keosaian J, Cerrada C, Weinberg J, Sherman KJ. Comparing Once- versus Twice-Weekly Yoga Classes for Chronic Low Back Pain in Predominantly Low Income Minorities: A Randomized Dosing Trial. *Evid Based Complement Alternat Med.* 2013;2013:658030.

- Saper RB, Sherman KJ, Cullum-Dugan D, Davis RB, Phillips RS, Culpepper L. Yoga for chronic low back pain in a predominantly minority population: a pilot randomized controlled trial. *Altern Ther Health Med* 2009;15(6):18-27.
- Sams Jamie, 1998. *Dancing the Dream: The Seven Sacred Paths of Human Transformation*. Harper, San Francisco, 274 p.
- Santaella DF, Araújo EA, Ortega KC, Tinucci T, Mion D Jr, Negrão CE, de Moraes Forjaz CL. After effects of exercise and relaxation on blood pressure. *Clin J Sport Med*. 2006 Jul;16(4):341-7.
- Sarang PS, Telles S. Oxygen consumption and respiration during and after two yoga relaxation techniques. *Appl Psychophysiol Biofeedback*. 2006 ;31(2):143-53.
- Schipper H. Guidelines and Caveats for Quality of Life measurement in clinical practice and research. *Oncology* 1990; 1:51-57.
- Schwickert M, Langhorst J, [Paul A](#), [Michalsen A](#), [Dobos GJ](#). Stress management in the treatment of essential arterial hypertension. [MMW Fortschr Med](#). 2006; 23;148(47):40-2.
- Schleifer LM, Ley R, Spalding TW, A hyperventilation theory of job stress and musculoskeletal disorders. *Am J Ind Med*. 2002 May; 41(5):420-32.
- Schofield DJ, Shrestha RN, Percival R, Callander EJ, Kelly SJ, Passey ME. Early retirement and the financial assets of individuals with backproblems. *Eur Spine J*. 2011 May;20(5):731-6. doi: 10.1007/s00586-010-1647-8. Epub 2010 Dec 5.
- Sembajwe G, Tveito TH, Hopcia K, Kenwood C, O'Day ET, Stoddard AM, Dennerlein JT, Hashimoto D, Sorensen G. Psychosocial stress and multi site musculoskeletal pain: a cross-sectional survey of patient care workers. *Workplace Health Saf*. 2013 Mar;61(3):117-25.

- Sethi J, Sandhu JS, Imbanathan V. Effect of Body Mass Index on work related musculoskeletal discomfort and occupational stress of computer workers in a developed ergonomic setup. *Sports Med Arthrosc Rehabil Ther Technol* 2011;3(1):22.
- Shaffer HJ, LaSalvia TA, Stein JP. Comparing hatha yoga with dynamic group psychotherapy for enhancing methadone maintenance treatment: a randomized clinical trial. *Altern Ther Health Med* 1997; 3:57-66.
- Shaw WS, Means-Christensen AJ, Slater MA, Webster JS, Patterson TL, Grant I, Garfin SR, Wahlgren DR, Patel S, Atkinson JH. Psychiatric disorders and risk of transition to chronicity in men with first onset low back pain. *Pain Med*. 2010 Sep;11(9):1391-400. doi: 10.1111/j.1526-4637.2010.00934.x. Epub 2010 Aug 23.
- Shaw WS, Reme SE, Pransky G, Woiszwillo MJ, Steenstra IA, Linton SJ. The pain recovery inventory of concerns and expectations: a psychosocial screening instrument to identify intervention needs among patients at elevated risk of back disability. *J Occup Environ Med* 2013;55(8).
- Sharma SC, Singh R, Sharma AK, Mittal R. Incidence of low back pain in workage adults in rural north India. *Indian Journal of Medical sciences* 2003; 57:145-7.
- Sharma VK, Das S, Mondal S, Goswampi U, Gandhi A. Effect of Sahaj Yoga on depressive disorders. *Indian J Physiol Pharmacol* 2005; 49:462-8.
- Shiri R, Solovieva S, Husgafvel-Pursiainen K, Taimela S, Saarikoski LA, Huupponen R, et al. (2008). The association between obesity and the prevalence of low back pain in young adults: the Cardiovascular Risk in Young Finns Study. *Am J Epidemiol*, 167, 1110-1119.

- Shirley Telles, Satish Kumar Reddy, Nagendra HR. Oxygen Consumption and Respiration Following Two Yoga Relaxation Techniques. *Applied Psychophysiology and Biofeedback* 2000; 25 (4).
- Shirley Telles, Nagarathna R, Nagendra H R, Desiraju T. Alterations in Auditory Middle Latency Evoked Potentials during Meditation on a Meaningful Syllable-OM. *International Journal of Neuroscience* 1994; 76:87-93.
- Shirley Telles, Nagarathna R, Nagendra HR. Autonomic Changes During OM Meditation. *Indian Journal of Physiology and Pharmacology* 1995; 39:418-420.
- Sherman KJ, Cherkin DC, Erro J, Miglioretti DL, Deyo RA. Comparing Yoga, Exercise, and a Self-Care Book for Chronic Low Back Pain. A Randomized, Controlled Trial. *Annals of Internal Medicine* 2005; 143(12): 849-856.
- Shuei Sugama and B. Conti, Interleukin-18 and stress. Department of Physiology, Nippon Medical School, 1-1-5 Sendagi Bunkyo-ku, Tokyo 113-8602, Japan bHarold L. Dorris Neurological Research Center, Molecular and Integrative Neurosciences Department, The Scripps Research Institute, CA 92037, USA, 2007.
- Sivananda S. Raja Yoga. The Divine Life Society, Rishikesh, Haridwar; 2012
- Skevington SM. (1998). Investigating the relationship between pain and discomfort and quality of life, using the WHOQOL. *Pain*, 76, 395-406.
- Spitzer WO, LeBlanc FE, Dupis M. Scientific approach to the assessment and management of activity related spinal disorders: A monograph for clinicians. *Spine* 1987; 12: 75.
- Sporn MB, Roberts AB. TGF-beta: problems and prospects. *Cell Regul* 1990;1:875-82.

- Sobel DS. (2000a). The cost-effectiveness of mind-body medicine interventions. *Prog Brain Res*:122, 393-412.
- Sobel DS. (2000b). MSJAMA: mind matters, money matters: the cost-effectiveness of mind/body medicine. *JAMA*: 284, 1705.
- Solidaki E, Chatzi L, Bitsios P, Coggon D, Palmer KT, Kogevinas M. Risk factors for new onset and persistence of multi-site musculoskeletal pain in a longitudinal study of workers in Crete. *Occup Environ Med* 2013;70(1):29-34.
- Spielberger CD, Gorsuch RL, Luskene RE. Test manual for State trait anxiety inventory. California: Consulting Psychologist Press; 1970-93.
- Sembajwe G, Tveito TH, Hopcia K, Kenwood C, O'Day ET, Stoddard AM, Dennerlein JT, Hashimoto D, Sorensen G. Psychosocial stress and multi-site musculoskeletal pain: a cross-sectional survey of patient care workers. *Workplace Health Saf.* 2013 Mar;61(3):117-25. doi: 10.3928/21650799-20130226-01. Sri Jnanānanda Bharati. The Essence of Yoga Vaasishta. Chennai: Samata Books. 1982.
- Sterud T, Tynes T. Work-related psychosocial and mechanical risk factors for low back pain: a 3-year follow-up study of the general working population in Norway. *Occup Environ Med.* 2013 May;70(5):296-302. doi: 10.1136/oemed-2012-101116. Epub 2013 Jan 15.
- Sudheer Deshpande, H R Nagendra , Nagarathna Raghuram. A randomized control trial of the effect of yoga on verbal aggressiveness in normal healthy volunteers. *International Journal of Yoga* 2008:76-82.
- Swami Gambhirānanda. *Katha Upaniṣad*. Kolkata: Advaita Ashrama. 1987.

- Swami Lokeswarānanda. Taittireya Upaniṣad. Kolkatta: The Ramakrishna Mission Institute of Culture. 1996.
- Swami Lokeswarānanda. Mandukya Upaniṣad. Kolkatta: The Ramakrishna Mission Institute of Culture. 1995.
- Swami Nikhilānanda. The Upaniṣads. Kolkatta: Advaita Ashrama. 2008.
- Swami Prabhavānanda. Patanjali Yoga Sutras. Chennai: Sri Ramakrishna Math. 2002.
- Swami Tapasyānanda. Srimad Bhagavad Gita. Chennai: Sri Ramakrishna Math. 2000.
- Taneja I, Deepak KK, Poojary G, Acharya IN, Pandey RM, Sharma MP. Yogic versus conventional treatment in diarrhea-predominant irritable bowel syndrome: a randomized control study. *Appl Psychophysiol Biofeedback*. 2004;29:2919-33.
- Telles S, & Desiraju T. (1993). Recording of auditory middle latency evoked potentials during the practice of meditation with the syllable 'OM'. *Indian Journal of Medical Research*,98,237-239.
- Telles S, Joseph C, Venkatesh S, Desiraju T. Alterations of auditory middle latency evoked potentials during yogic consciously regulated breathing and attentive state of mind. *Int J Psychophysiol*. 1993; 14:189-98.
- Telles S, Nagarathna R, Nagendra HR. Breathing through a particular nostril can alter metabolism and autonomic activities. *Indian J Physiol Pharmacol* 1994; 38(2): 133-137.
- Telles S, Nagarathna R, Nagendra HR. Improvement in visual perception following yoga training. *Journal of Indian Psychology* 1995; 13:30-32.

- Telles S, Narendran S, Raghuraj P, Nagarathna R, Nagendra HR,. Comparison of changes in autonomic and respiratory parameters of girls after yoga and games at a community home. *Perceptual and Motor Skills* 1997; 84:251-257.
- Telles S, Srinivas RB. Autonomic and respiratory measures in children with impaired vision following yoga and physical activity programs. *International Journal of Rehabilitation and Health* 1999; 4 (117-122).
- Telles S, Raghuraj P , Ghosh A, Nagendra HR,. Effect of yoga on performance in a mirror tracing task. *Indian Journal of Physiology and Pharmacology* 2006; 50:187-190.
- Telles S, Naveen KV, Dash M. Yoga reduces symptoms of distress in tsunami survivors in the andaman islands. [Evid Based Complement Alternat Med.](#) 2007 Dec;4(4):503-9.
- Tekur P, Nagarathna R, Chametcha S, Hankey A, Nagendra HR. A comprehensive yoga programs improves pain, anxiety and depression in chronic low back pain patients more than exercise: an RCT. *Complement Ther Med.* 2012 Jun;20(3):107-18.
- Tekur P, Singphow C, Nagendra HR, Raghuram N.Effect of short-term intensive yoga program on pain, functional disability and spinal flexibility in chronic low back pain: a randomized control study.*J Altern Complement Med* 2008 Jul;14(6):637-44.
- Tekur P, Chametcha S, Hongasandra RN, Raghuram N.Effect of yoga on quality of life of CLBP patients: A randomized control study.*Int J Yoga.* 2010 Jan;3(1):10-7.
- Tilbrook HE, Cox H, Hewitt CE, Kang'ombe AR, Chuang LH, Jayakody S, Aplin JD, Semlyen A, Trewhela A, Watt I,Torgerson DJ. Yoga for chronic low

back pain: a randomized trial. *Ann Intern Med.* 2011 Nov 1;155(9):569-78. doi: 10.7326/0003-4819-155-9-201111010-00003.

- Tippet Krista, 2007. *Speaking of Faith*. Viking, 238 p.
- Truchon M. (2001). Determinants of chronic disability related to low back pain: towards an integrative biopsychosocial model. *Disabil Rehabil*: 23, 758-767.
- Turk DC, Meichenbaum D, Genest M. *Pain and Behavioural Medicine: A Cognitive-behavioural Perspective*. New York. Guilford Press. 1983.
- Turk DC. (1999). The role of psychological factors in chronic pain. *Acta Anaesthesiologica Scandinavica*, 43, 885-888.
- US Burden of Disease Collaborators. The state of US health, 1990-2010: burden of diseases, injuries, and risk factors. *JAMA*. 2013 Aug 14;310(6):591-608. doi: 10.1001/jama.2013.13805.
- Urquhart DM, Kelsall HL, Hoe VC, Cicuttini FM, Forbes AB, SimMR, Are Psychosocial Factors Associated With Low Back Pain and Work Absence for Low Back Pain in an Occupational Cohort? *Clin J Pain*. 2013.
- Valet M, Sprenger T, Boecker H et al. (2004) Distraction modulates connectivity of the cingulo-frontal cortex and the midbrain during pain – an fMRI analysis. *Pain* 109, 399 -408.
- van Tulder M, Malmivaara A, Esmail R, & Koes B. (2000). Exercise therapy for low back pain: a systematic review within the framework of the cochrane collaboration back review group. *Spine*: 25, 2784-2796.
- [van tulder, Koes B, Bombardier C](#). Low back pain. *Best Pract Res Clin Rheumatol*. 2002 Dec;16:761-75
- van Tulder MW., Furlan AD., Gagnier JJ, Complementary and alternative therapies for low back pain. *Best Pract Res Clin Rheumatol*. 2005; 19:639-54.

- Vargas-Prada S, Martínez JM, Coggon D, Delclos G, Benavides FG, Serra C. Health beliefs, low mood, and somatizing tendency: contribution to incidence and persistence of musculoskeletal pain with and without reported disability. *Scand J Work Environ Health*. 2013.
- Vedanthan PK, Keshavulu LN, Murthy KC, Duvall K, Hall MJ, Baker S, Nagarathna R. Clinical study of yoga techniques in university students with asthma: a controlled study. *Allergy Asthma Proceedings* 1998; 19: 3-9.
- Vempati RP, & Telles S (2002). Yoga-based relaxation reduces sympathetic activity judged from base line levels. *Psychological Reports*, 90, 487-494.
- Vempati RP and Telles S. (1999). Yoga based relaxation versus supine rest: a study of oxygen consumption, breath rate and volume & autonomic measures. *Journal of Indian Psychology*, 17: 46-52.
- Vempati R, Bijlani RL, Deepak KK. The efficacy of a comprehensive lifestyle modification programme based on yoga in the management of bronchial asthma: a randomized controlled trial. 2009;30;9:37.
- Verbunt JA, Seelen HA, Vlaeyen JW, Bousema EJ, van der Heijden GJ, Heuts PH, et al. (2005). Pain-related factors contributing to muscle inhibition in patients with chronic low back pain: an experimental investigation based on superimposed electrical stimulation. *Clin J Pain*, 21, 232-240.
- Verbunt JA, Pernot DH, Smeets RJ. Disability and quality of life in patients with fibromyalgia. *Health Qual Life Outcomes*. 2000;6:8.
- Vlaeyen JW, Haazen IW, Schuerman JA, Kole-Snijders AM, & van Eek H. (1995). Behavioural rehabilitation of chronic low back pain: comparison of an operant treatment, an operant-cognitive treatment and an operant-respondent treatment. *Br J Clin Psychol*: 34, 95-118.

- Vlaeyen JW, Kole-Snijders AM, Boeren RG, & van Eek H. (1995). Fear of movement/(re)injury in chronic low back pain and its relation to behavioural performance. *Pain*, 62, 363-372.
- Vlaeyen JW & Linton SJ. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*, 85, 317-332.
- Vidyasagar JVS, Prasad BN, Reddy V, Raju PS, Jayshankar M, Sampath K. Effects of yoga practices in nonspecific low back pain. *Clin Proc NIMS* 1989; 4: 160-164.
- Vijayalakshmi P, Madanmohan, Bhavanani AB, Patil A, Babu K. Modulation of stress induced by isometric handgrip test in hypertensive patients following yogic relaxation training. [Indian J Physiol Pharmacol](#). 2004 Jan;48(1):59-64.
- Visweswaraiiah NK, Telles S. Randomized trial of yoga as a complementary Therapy for pulmonary tuberculosis. *Respirology* 2004; 9:96-101.
- Vuori IM. (2001). Dose-response of physical activity and low back pain, osteoarthritis, and osteoporosis. *Med Sci Sports Exerc*, 33,551-586; discussion 609-510.
- Waddell G, Main CJ, Morris EW, Di Paola M & Gray IC. (1984). Chronic low-back pain, psychologic distress, and illness behavior. *Spine*, 9 209-213.
- Walker BF. (1999). The prevalence of low back pain in Australian adults. Asystematic review of the literature from 1966-1998. *Asia Pac J Public Health*, 11, 45-51.
- Walker JG, et al., Stress system response and rheumatoid arthritis: a multilevel approach. *Rheumatology (Oxford)*, 1999. 17: 515-518.
- Walker BF. (2000). The prevalence of low back pain: a systematic review of the literature from 1966 to 1998. *J Spinal Disord*, 13, 205-217.

- Walker BF, Muller R & Grant WD. (2004). Low back pain in Australian adults: prevalence and associated disability. *J Manipulative Physiol Ther*, 27, 238-244.
- West J, Otte C, Geher K, Johnson J, Mohr DC. Effects of Hatha yoga and African dance on perceived stress, affect, and salivary cortisol. *Ann Behav Med* 2004; 28:114-118.
- The WHOQOL group. WHOQOL-BREF: Introduction, Administration, Scoring and Generic Version of the Assessment. Field Trial Version. Geneva: WHO; 1996.
- Whicher Ian, 1998. *The Integrity of the Yoga Darsana: A Reconsideration of Classical Yoga*. State University of New York Press, Albany, NY, 426 p.
- Wilber Ken, 1998. *The Eye of Spirit: An Integral Version for a World Gone Slightly Mad*. Shambhala, Boston, Conn., 414 p.
- Williams AC, Nicholas MK, Richardson PH, Pither CE, Justins DM, Chamberlain JH, Harding VR, Ralphs JA, Jones SC, Dieudonne I, Featherstone JD, Hodgson DR, Ridout K L, Shannon EM. Evaluation of a cognitive behavioral program for rehabilitating patients with chronic pain. *British Journal of General Practice* 1993; 43: 513-518.
- Williams KA, Petronis J, Smith D, Goodrich D, Wu J, Ravi N, Doyle EJ , Gregory Jukett R, Munoz Kolar M, Gross R, Steinberg L. Effect of Iyengar Yoga therapy for chronic low back pain. *Pain*. 2005 May; 115 (1-2):107-17.
- Wood CJ. (1993). Mood change and perceptions of vitality: a comparison of the effects of relaxation, visualization and yoga. *Royal Society Medicine*, 86, 254-258.

- Woolery A, Myers H, Sternlieb B, Zeltzer L. A yoga intervention for young adults with elevated symptoms of depression. *Altern Ther Health Med* 2004; 10:60-3
- Williamas AC, Nicholas MK, Richardson PH, Pither CE, Justins DM, Chamberlain JH, et al. Evaluation of a cognitive behavioral program for rehabilitating patients with chronic pain. *Br J General Pract.* 1993;43:513–8.
- Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Organ* 2003;81(9):646-56.
- Xu L, Wang ZL, Chen B, Wu L, Yi GL, Li JC, He LH, Wang S, Yang L [Survey on the occupational musculoskeletal disorder and its risk factors among male steelworkers]. *Zhonghua Yu Fang Yi XueZaZhi.* 2013 Mar;47(3):249-54.
- Yu SF, Gu GZ, Zhou WH, Wang HS, Sun SY, Yang XF, Zhou SY. Association between occupational stress and musculoskeletal disorders in lower extremity. *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing ZaZhi* 2011;29(12):882-6.
- Zollman C & Vickers A.1999). What is complementary medicine? *BMJ,* 319(7211), 693-696.

## **CHAPTER 10**

# **TABLES**

**TABLE 1 VARIABLE BEFORE AND AFTER THE SEVEN DAYS PRACTICE OF  
IAYT**

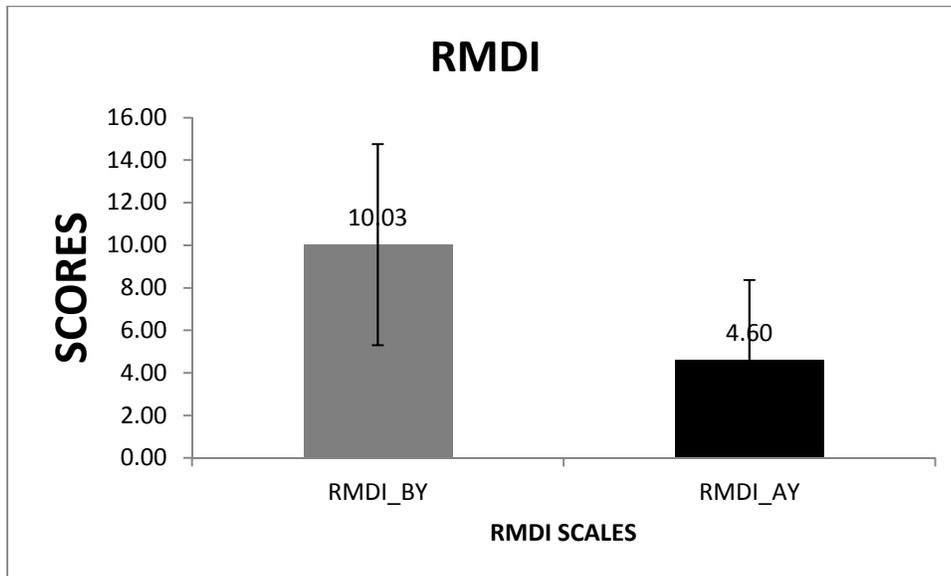
VARIABLES	Mean ± SD		(↑) % increase (↓) % decrease	P
	BEFORE	AFTER		
RMDI	10.03±4.72	4.60±3.77	54.13↓	<0.001***
PAS	64.29±19.86	8.87±10.21	86.20↓	<0.001***
SS	8.1±5.59	2±2.6	75.00 ↓	< 0.001***
SAR	26.47±11.12	37.58±12.07	41.96↑	<0.001***
SLR RT	59.86±20.49	84.14±10.18	40.57↑	<0.001***
SLR LT	62.43±19.98	84.00±9.61	34.55↑	<0.001***
STAI	41.11±8.93	24.63±3.55	40.10↓	<0.001***
STA2	42.17±7.73	25.80±3.55	38.82↓	<0.001***
BDI	10.91±7.35	3.29±4.23	69.90↓	<0.001***
GHQ A	1.40±1.40	0.17±0.51	87.76↓	<0.001***
GHQ B	1.60±1.44	0.17±0.51	89.29↓	<0.001***
GHQ C	1.31±1.47	0.17±0.45	86.96↓	<0.001***
GHQ D	0.77±1.37	0.12±0.54	84.75↓	= 0.001
GHQ_TOTAL	5.11±4.16	0.63±1.68	87.71↓	<0.001***

Variables	Mean ± Standard Deviation for n=35		% increase (↑)	<i>P</i>
	Before IAYT	After IAYT	% decrease (↓)	
<b>SYS</b>	<b>119.09±12.96</b>	<b>110.8±9.2</b>	<b>6.94↓</b>	<b>&lt; 0.001***</b>
<b>DIA</b>	<b>78±9.05</b>	<b>72±5.56</b>	<b>7.5↓</b>	<b>&lt;0.001***</b>
<b>PR</b>	<b>82.31±8.70</b>	<b>76.54±6.22</b>	<b>7.01↓</b>	<b>&lt;0.001***</b>
<b>RR</b>	<b>17.57±3.48</b>	<b>14.29±2.92</b>	<b>18.7 ↓</b>	<b>&lt;0.001***</b>
<b>BHT</b>	<b>15.91±7.83</b>	<b>22.4±9.13</b>	<b>40.57↑</b>	<b>&lt;0.001***</b>
<b>WT</b>	<b>68.0±13.8</b>	<b>66.8±13.3</b>	<b>1.8 ↓</b>	<b>= 0.001</b>

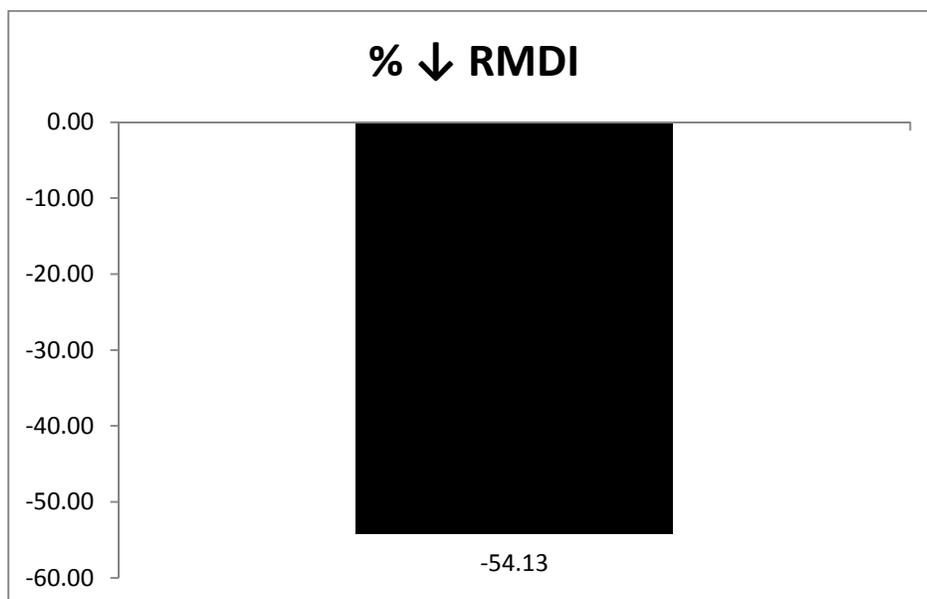
## **CHAPTER 11**

# **FIGURES**

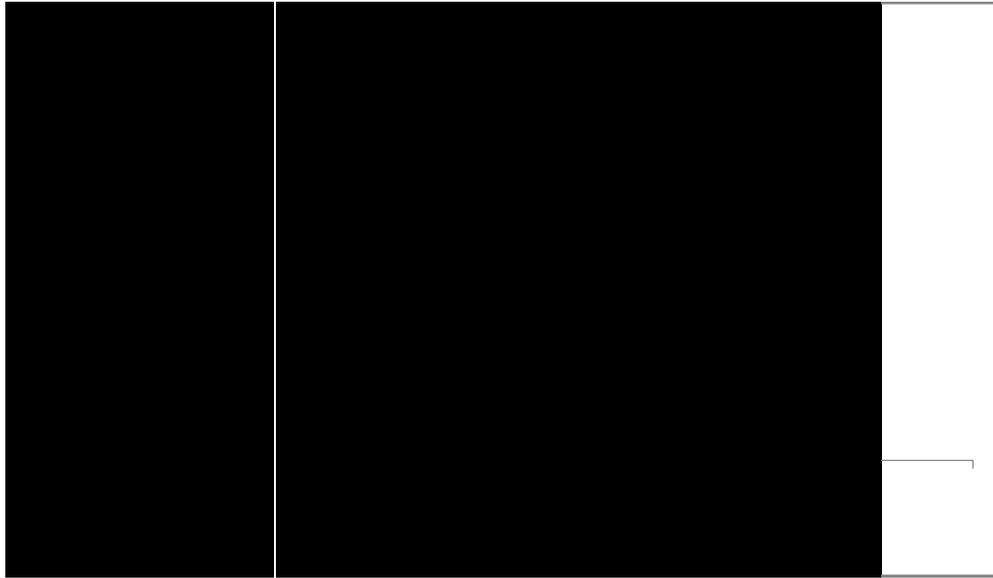
**FIGURE 1 RMDI BEFORE AND AFTER THE IAYT**



**FIGURE 2 RMDI%↓ AFTER THE IAYT**



**FIGURE 3 PAS BEFORE AND AFTER THE IAYT**



**FIGURE 4 PAS %↓ AFTER THE IAYT**



**FIGURE 5 SS AND MS BEFORE AND AFTER THE IAYT**



**FIGURE 6 SS AND MS %↓ AFTER THE IAYT**



**FIGURE 7 SAR BEFORE AND AFTER THE IAYT**



**FIGURE 8 SAR %↓ AFTER THE IAYT**



**FIGURE 9 SLR BEFORE AND AFTER THE IAYT**



**FIGURE 10 SLR %↑ AFTER THE IAYT**



**FIGURE 11 STAI BEFORE AND AFTER THE IAYT**



**FIGURE 12 STAI %↓ AFTER THE IAYT**



**FIGURE13 BDI BEFORE AND AFTER THE IAYT**



**FIGURE 14 BDI %↓ AFTER THE IAYT**

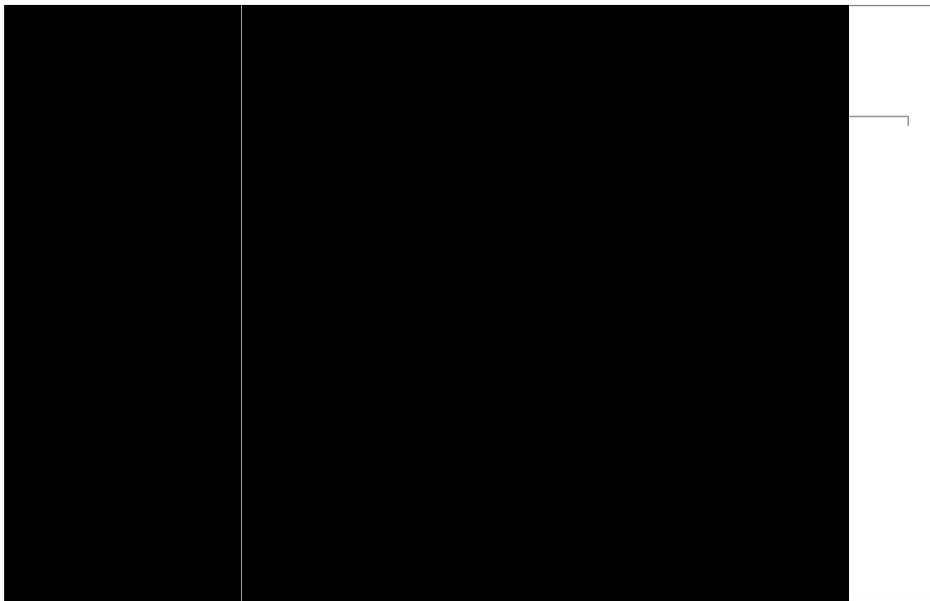


FIGURE15 GHQ BEFORE AND AFTER THE IAYT

FIGURE 16 GHQ %↓ AFTER THE IAYT



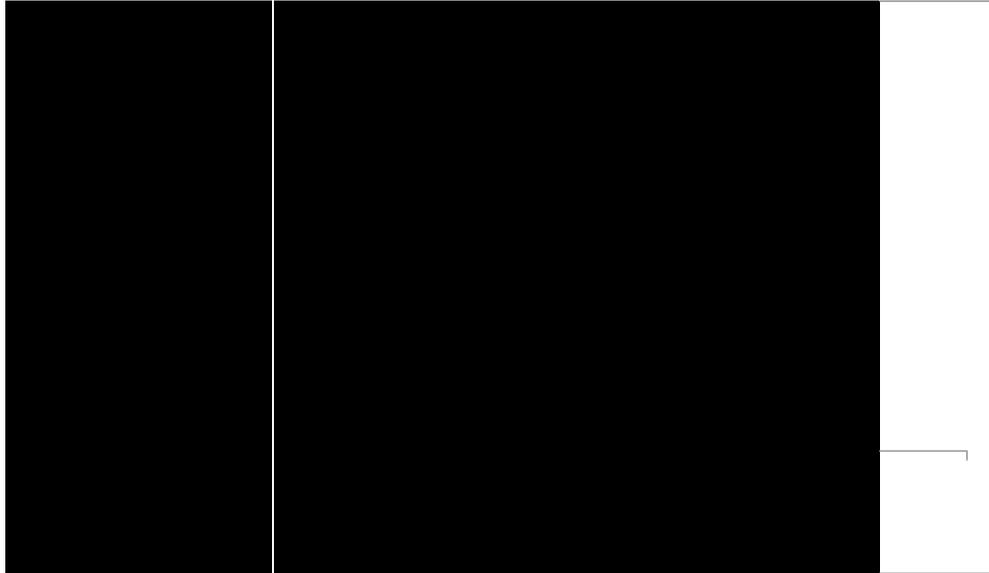
**FIGURE17 BP BEFORE AND AFTER THE IAYT**



**FIGURE 18 BP %↓ AFTER THE IAYT**



**FIGURE 19 PR BEFORE AND AFTER THE IAYT**



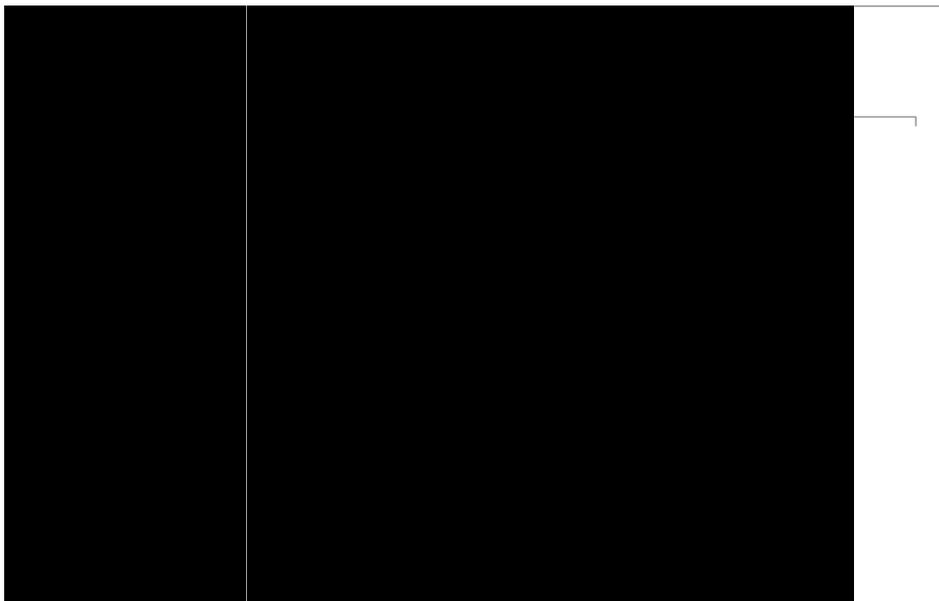
**FIGURE 20 PR %↓ AFTER THE IAYT**



**FIGURE 21 RR BEFORE AND AFTER THE IAYT**



**FIGURE 22 RR %↓ AFTER THE IAYT**



**FIGURE 23 BHT BEFORE AND AFTER THE IAYT**



**FIGURE24 BHT %↑ AFTER THE IAYT**



**FIGURE 25 WT BEFORE AND AFTER THE IAYT**



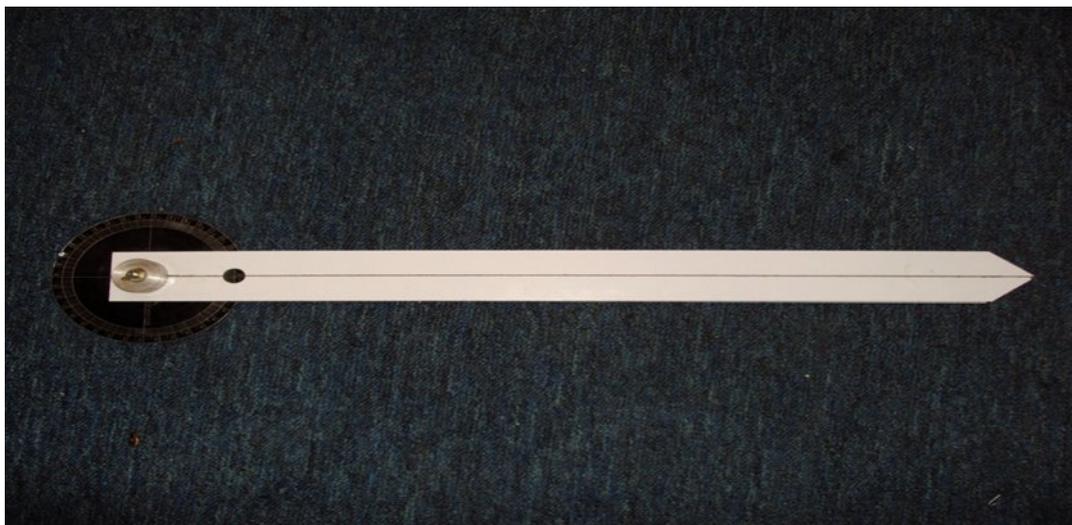
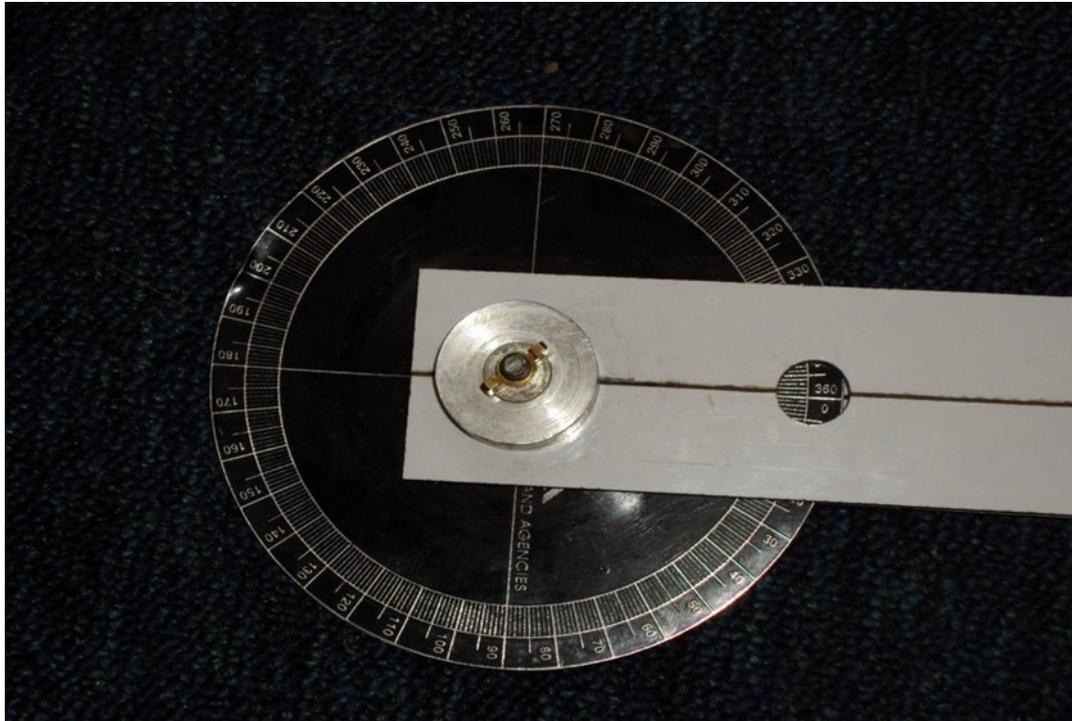
**FIGURE 26 WT %↓ AFTER THE IAYT**



## **CHAPTER 12**

# **PLATES**

# Plate-1: INSTRUMENT FOR MEASURING STRAIGHT LEG RAISING



**Plate-2: INSTRUMENT FOR MEASURING SIT AND REACH.**



**CHAPTER 13**

**APPENDICES**

13.1 APPENDIX

**INFORMED CONSENT FORM**

**Title of the project:** "EFFECT OF INTEGRATED APPROACH OF YOGA  
THERAPY ON BACK PAIN AS MEASURED BY  
ROLLAND MORRIS DISABILITY INDEX"

**Investigator** : Jalandhar Bhatt

**Name of the Guides** : Dr. Padmini Tekur:  
Dr. Tikhe Sham Ganpat

**Name of the Participants** : \_\_\_\_\_

**Date and Time** : \_\_\_\_\_ and \_\_\_\_\_

**About the Project** :

This study deals with concept of healing power of IAYT on the Disability measured by Rolland Morris Disability Index. All information obtained during the study will be kept confidential and individual report of the test will be given.

1. You can withdrawal from the study at any point of the time unconditionally.
2. In case the study does cause any adverse effects, the institution is not liable.

I hereby have understood the above and consent voluntarily to participant in the study.

**Place** : \_\_\_\_\_

**Date** : \_\_\_\_\_

**Signature of the Participant**

13.2 APPENDIX

**DEMOGRAPHIC INFORMATION FORM**

*Instructions:* Please provide a response for each of the following questions:

1. Name-----

2. Age -----

3. Gender

Female  Male

4. Marital status

Single  Married  Separated  Divorced  Widowed

5. Hobby-----

6. What is your annual income (or combined annual income if you have a spouse)?

Less than Rs 10,000  RS 10,001 to Rs 20,000  RS 20,001 to 30,000

Rs 30,001 to Rs 40,000  Rs 40,001 to Rs 50,000  Greater than Rs 50,000

### 13.3 APPENDIX

## CALCULATION OF EFFECT SIZE

### CALCULATION OF EFFECT SIZE

For estimating sample size in the present study, the effect size of previous similar study (Tekur P, Chametcha S, Hongasandra RN, Raghuram N. Effect of yoga on quality of life of CLBP patients: A randomized control study. Int J Yoga 2010;3:10-7 ) was studied by using G\*Power program with following outcome

Assessment	Mean Difference	SD Difference
Straight leg raising right side	16.75	3.50

### Power Analysis

Alpha	Power	Effect size	Sample Size
0.01	0.8	0.948	16+16

For better estimation of result of the proposed study, we will be using sample size of total 40.

### 13.4 APPENDIX

## INTERVENTION DETAILS IAYT

### **Integrated Approach of Yoga Therapy (IAYT)**

The dictionary meaning of 'Therapy' is treatment intended to relieve or heal physical disorders or illness. The term "Therapy" is originated from the Greek word "Therapy means healing. As illness refers to both body and mind, therapy covers treatment of illness of both body and mind. This for, the conventional medication that is the allopathic treatment is very successful with all its new medicines, medical engineering and technology. However the approach is limited in the treatment of the body and mind separately. This is because, disease in modern medical perspective is considered as improper functioning of organs and system which may be due to congenital defects by external atmospheric agents like allergens, toxins, pollutants or infections germs. However, modern science does recognize that the other major cause of diseases could be the factor of internal balances like mental restlessness emotional upsurges or intellectual conflicts that lead to stress situations. The common man will accept any system or process if it can prove its usefulness in his day-to-day aspects of life, just like science and technology were accepted and adopted as they solved a lot of our problems regarding basic necessities. Similarly yoga offers man a conscious process to solve the menacing problem of unhappiness, restlessness, emotional upsurges, hyperactivity, etc, and helps to evoke the hidden potential of man in a Yoga is a systematic and scientific way by which man becomes a better individual.

All his faculties – physical, mental, intellectual and emotional develop in a harmonious fashion to meet the challenges of the ever demanding modern technological era.

In the Yogic tradition describes the five layers of human existence i.e. the concept of “Panca Kośa” as described in Taittiriya Upaniśad. These five layers are: -

Annamaya Kośa	:	Physical sheath
Prāṇamaya Kośa	:	Vital sheath
Manomaya Kośa	:	Mental sheath
Vijñānamaya Kośa	:	Wisdom sheath
Ānandamaya Kośa	:	Bliss sheath

### **Annamaya Kośa:**

This entire universe is made of ‘Anna’ or matter. Everything comes out of Anna. Our physical body is made of ‘Anna’ or matter. This matter-based aspect of our physical personality is Annamaya Kośa. Annamaya Kośa consists of five elements, which are pancamahābhutās namely- prithvī, jala, Vāyu, ākaśa and Agni. The movement of the body from one place to another, feelings of hunger and thirst, the needs of the physical body, all belong to the experience of Annamaya Kośa. Practices at Annamaya kośa (the physical layer) A healthy yogic diet, Kriyās, loosening exercises and Yogāsanas are used to operate at the Annamaya Kośa level and to remove the physical symptoms of the ailments.

### (i) Diet

Sāttvic diet which is easy on the system is recommended by the Gītā. Sri Krishna describes it in the śloka about lifestyle modification.

आयुः सत्त्वबलारोग्यसुखप्रीतिविवर्धनाः ।

रस्याः स्निग्धाः स्थिरा हृद्या आहाराः सात्त्विकप्रियाः ॥ गीता ८ १७-८ ॥

*Āyuh sattvabalārogyasukhaprītivivardhanāḥ ।*

*rasyāḥ snigdhaḥ sthirā hṛdyā āhārāḥ sāttvikapriyāḥ ॥ Bh. Gi. 17 - 8 ॥*

(ii) Kriyās - These are yogic processes described in Haṭha Yoga to cleanse the inner organs of our body. They bring about the following effects (a) Activating and revitalising the organs, (b) Toning up their functions, (c) Desensitization and (d) Development of deep internal awareness. Among the major Kriyās enumerated in the texts of Yoga, simplified versions of a few Kriyās like catheter Neti, Jala Neti, Kapālabhāti, Agnisāra, Vaman Dhouti (Kuñjal Kriyā), etc. are used extensively.

(iii) Physical exercises and Movements – Hithilṛkaraṇa Vyāyāma

Very simple physical movements to mobilize and activate the affected parts of the body are used. Some easy physical exercises are adopted to fulfill the needs of the particular ailments to (a) loosen the joints (b) stretch and relax the muscles, (c) improve the power and (d) develop stamina. Most of the back pain special techniques are drawn from this group of practices.

#### (iv) Yogāsanas - Postures

Yogāsanas are physical postures often imitating the natural positions of the animals meant to mobilize and activate the affected parts of the body and make the mind tranquil. Yogāsanas, when maintained for a while leads to revitalization and deep relaxation and mental calmness. The āsanas not only remove the disturbances of the body but also bring a person to a state of mental balance with a feeling of expansion. A large number of yoga practices available in the texts of yoga are adapted to balance and harmonies the disturbances at each of the five Koḥas and tackle this type of complex psychosomatic ailments.

थरसुखमासन्माप यो sU २-४६॥

*Sthirasukhamāsanam* ||P.Y.S 2-46||

य शैथि यान तसमाप ् ॥ ॥ पाप्मे sU २-४७॥

*Prayatnaśaithilyānantasam āpattibhyām* ||P.Y.S. 2-47||

Prāṇamaya Koḥa:

Prāṇa is the basic fabric of the universe both inside and outside our body. It is the vital life force. A uniform harmonious flow of Prāṇa to each and every cell of the Annamaya Koḥa keeps them alive and healthy. Prāṇa flows through subtle channels called nādis. The five Panca Prāṇas are Prāṇa, apāna vyāna, samāna and vyāna. A balance between these five Prāṇas is health and imbalance is ill-health.

**Prāṇamaya Koḥa (The layer of Prāṇa)**

**(i) Techniques of prāṇa mastery in healing- Praḥnopaniḡad.**

Prāṇa is the basic life principle. Prāṇāyāma is a process for gaining control over Prāṇa. The five manifestations of Prāṇa and the corresponding most comprehensive definition of Prāṇāyāma in the human system are described in Praḥnopaniḡad. Also the conventional Prāṇāyāma through regulation of breath is described therein. Through the practice of proper breathing, Kriyas and Prāṇāyāma, we start operating on the Prāṇamaya Koḡa. Suitable types of Prāṇāyāma and breathing help to remove the random agitations in Prāṇic flows in the Prāṇamaya Koḡa. Thus, the ailments are handled at this Prāṇamaya Koḡa level.

त म सति तस तसयोगति णायच्छेदः ॥पयो सू २-४९॥

*Tasmin Sati Śvāsapraśvāsayogativicchedaḡ Praḡayāmaḡ ||P.Y.S 2-49||*

**(ii) Explanation: The Prāṇa energy model.** All living beings are born with a stock of Prāṇa shakti sufficient for one life time. We spend a quantum of Prāṇa daily to carry out our activities. When we carry out activities a balance between the quantity of Prāṇa drawn and spent is necessary for health.

The amount of Prāṇa that is drawn and used up in subtle areas of the brain decides whether we are happy or unhappy. If there is excessively speeded up mind it draws too much Prāṇa and does not spend enough. This results in accumulation of Prāṇa which needs to be released through some form of physical activity. For eg.if we are terribly depressed due to demise of a kith and kin repetition of thoughts of missing the deceased draws excess energy to the brain

area. Thus the Prāña drawn (Pd) is too much and Prāña spent (Ps) is too little and the load of the residual Prāña that accumulates (Pa) is responsible for the heavy feeling. Thus Pa is responsible for feeling of the bursting pressure in the head. When you cry you release some of this unspent energy from the Pa and this leads to a big relief. Let us see this in this formula.

$Pd$  (Prāña drawn) =  $Ps$  (Prāña spent) +  $Pa$  (Prāña accumulated). For eg  $3000Pd = 2000Ps + 1000Pa$ . This residual  $Pa$  (energy accumulated) is responsible for duḥka or tension. The vice versa is true for the experience of happiness through sense pleasures. When we eat a sweet dish or listen to a good music or dance (Viṣaya Viṣayi Sambhoga) the balance is reversed and we feel happy. Here the formula may be represented as  $5000Pd = 5000ps + 0Pa$ . This negative balance of  $Ea$  leads to a feeling of freedom in the brain areas which is experienced as pleasure.

Thus, sense pleasures drain away our energy. But it is temporary and can promote early aging because of draining of large quantities of Praia. Pain could increase  $Pd$  and  $Pa$ . Sleep could decrease  $Pd$  and  $Pa$ . From this we may say that a healthy longevity can be achieved by lesser  $Pd$  and  $Pa$  in balance. Yoga trains to develop mastery over this Prāña management The technique is slowing down the breathing, relaxing the body and calming down the mind.

Once this mastery is achieved through awareness there occurs enormous joy because of the freedom to manipulate the Prāña at will. One can develop complete freedom from pain by using these Prāñáyāma techniques

**Manomaya Kośa:**

The third Kośa is the mind; the set of emotions; the likes (rāga) and dislikes (dveeśa). Manas (mind) is the source of everything. It is this Kośa that is the root cause of all human joys and distress. When emotions grow stronger; they govern against our right actions. This leads to imbalance called ādhi or stress. Long standing Ādhi gets pushed into Prāñamaya Kośa and Annamaya Kośa causing vyādhi. Practices at Viṣṇānamaya Kośa:

**1. Basic understanding:** reading scriptures like Bhagavad- Gītā and upaniśads, which explain how to lead a balanced life of perfection.

**2. Happiness analysis:** Ānandamimāṃsā of Taittirīya Upaniśads handles the most fundamental problem relevant to all living creatures and helps the person to change his attitude of greed and deep attachment towards material possessions.

It also leads to the realization that happiness is within and 'each one of us' in our causal state is an embodiment of ānanda.

**3. Lectures & counseling:** it is the lack of that inner knowledge which is responsible for many wrong habits and is a cause of agitations. It is by counseling one realizes his mistakes and works towards improvement. Lectures also give a right direction to a person who wants to improve.

#### **4. Kāma, Prema and Bhakti**

Love is one of the most powerful emotions manifest in all beings. At its grossest level it projects itself as lust. This Kāma is insatiable and energy-sapping. Its effect is like a tempest after sunset. Selfishness reigns supreme in this. But Prema (pure love) is elevating. Its gentle spring always remains fresh. Featured by

Tyága (sacrifice), the lover finds his happiness in that of his beloved. “Tat Sukha Sukhitvam” N.B.S: 24 is the formula, says Nárada. Much greater is the bliss of Prema compared to the joy of Káma. Bhakti is Prema (love) with total surrender. With the “Haraṇágati” of himself and his ego at the feet of the Lord, man merges himself into his Lord culminating in sāksātkāra. In this state, the Bhakta experiences an ecstatic bliss.

### **5. Sing with Bháva**

Songs in devotional sessions are aimed to tune the heart-strings towards a self-elevating Bhakti bháva. Come, join the group, sing aloud. This is the way to purify your emotions and grow towards perfection or Divinity. In training the right brain, it is the Bháva (attitude) that matters more than mere words.

That is why hymns, whatever be the language, have universal appeal. There is a heavenly rhythm, a harmony and a melody in every sound and sigh. If these are fine-tuned with Prema and Bhakti, one reaches the heights of happiness - the zenith of ecstasy. Sing loudly with the group; sway with the sound. Let your heart melt, let tears roll down your cheeks freely; let go all your feelings without inhibitions. You feel light in the head. Your emotional suppressions diminish, diffuse and vanish like clouds before sunshine.

You come out of the session with a lightness of heart and the gloom of unknown sorrow changes into a bright gleam of joy. The world appears a better place. Serve others too with this elixir of happiness by emotion culture.

**Emotion culture:** devotional sessions containing prayers, chants, bhajans, nāmāvalis, dhunās, stotrās, help to build a congenial atmosphere to evoke, recognize and dissipate the emotions.

Vijñānamaya Koṣa:

It is the fourth layer of existence. This can be explained, as the intuitive ability of the mind. It is the higher intellect; the seat of perfect thoughts and knowledge. It is the discriminating faculty of every individual. It works on conscience, which continuously guides the Manomaya Koṣa to get the mastery over the basic instincts. It is this component of mind which differentiates man from animals.

Questioning attitude and logical thinking is the key to operate from Vijñāna maya Koṣa. Upaniṣads are the treasury of such knowledge which is the redeemer of all miseries and obsessions. It is the lack of inner jñāna which is responsible for many wrong habits, agitations, etc. This is also the purpose of jñāna yoga which includes steps such as Śravaṇa Manana and Nididhyāsana. Śravaṇa is listening to the right knowledge, Manana is cogitating about it and Nididhyāsana is incorporating it into the system. The secret for happiness, therefore, is conquering of the agitation of mind through knowledge. Once the mind is calm through the logic of knowledge, the understanding becomes deeper and goes beyond the logic and one is able to handle the stressors in a healthy way.

Different Upaniṣads use different models (prakriyās) and techniques (upāsanas) to purify and prepare the mind for this knowledge (Jnana) . In this

state of Jnana of the true nature of the universal self the seeker experiences unlimited happiness and complete freedom from distress.

### **1.Taittirīya Upaniḡad**

This provides two models to move towards realization of the truth.

### **2.Pañca kośa Viveka model.**

It is a search for the basic principle of this creation.We have seen earlier how Taittirīya upaniḡad brings out this model of Pañca kośa Viveka wherein Bhrgu was able to reach this state of anandamaya kosa.through guided tapas by his father Varuna.

### **3. The Happiness Analysis model or Ānanda Mīmāṃsā**

This handles the most fundamental problem relevant to all living creatures. Search for happiness is instinctive to sustain creation and to avoid fear and death. It is essential to move towards bliss and overcome misery. The analysis systematically leads the student to that substratum from which Prāñā and mind emerge - the Ānandamaya Kośa. It leads to the realisation that happiness is within and 'each one of us' in our causal state is 'Ānanda' embodied. As a result, man's outlook in life changes. Knowledge burns the strong attachments, obsessions, likes and dislikes which are the basic reasons for the agitations of mind.

The Sāra type of Ādhis can only be removed by this knowledge (Ātma-Jñāna or Self-realisation). The aim of life is within you. Happiness is not in the object of enjoyment. This is shown in the

1. Law of diminishing returns.
2. It varies from person to person.
3. Happiness is there with or without it.
4. Depends on one's mood.

Is happiness concentration of the mind? No. Happiness is an inner state. It is an inner silence that is a state of being. Sense objects only give

Ānandamaya Kośa:

This is the causal layer of our existence. It is the layer of bliss. This is the most suitable aspect of our existence, which is devoid of any emotion, a state of total silence, a state of complete harmony, and perfect health. It is the subtlest among the five layers of our existence. The ānanda is the basic stuff of this universe from which everything has been created.

#### **4. The Science of Illness**

In Ānandamaya Kośa, a man is healthiest with perfect balance of all his faculties. At Vijñānamaya Kośa there are movements, but they are focused in the right direction. It is at the Manomaya Kośa that the imbalance starts. Likes and dislikes come in action at this level.

They start governing our actions, often in the wrong direction. The actions focused towards the wrong direction cause imbalance. These amplify themselves, resulting in mental illness called Ādhi.

At this level there are no symptoms at the physical level. Prompted by the permanent growth of desires, these mental illnesses get concealed in us, begin to manifest externally and gradually they percolate to the physical frame. The Ādhi is twofold namely -'Samānya' (ordinary) and 'sāra' (essential). The Samānya Ādhi is normally produced during the interactions with the world. These may be termed as psychosomatic ailments. When dealt with suitable techniques & congenial atmosphere, ādhis of the Samānya type will vanish. Along with it are destroyed the physical ailments i.e. 'Vyādhis' caused by the ādhis i.e. Ādhija vyādhi. When the mind is agitated during our interaction with the world at large, the physical body is also affected. The subtler 'ādhis' of essential type (sāra), which are caused at birth of the physical body, can only by realization of the causal, Ānandamaya Kośa and Vijñānamaya Kośa. In that state man transcends the cycles of birth and death.

The imbalances in Manomaya Kośa cause disturbances in the prāṇic body and unsteadiness in the Nāḍi, hence disturbing the digestive process. This gives rise to irregular, poor and over digestion. When the improperly digested food settles down in the body as a toxic waste, it results in ailments of the psychosomatic type. Ailments that don't have their origin in the mind are called Anādhija vyādhis. It includes infectious and contagious diseases, which can be medically cured

Practices for Integrated Approach of Yoga Therapy:

Yoga therapy does not only treat the person at the physical level but goes to the root cause of the disease. In order to eradicate root cause of the ailment, yoga therapy works on an individual with an integrated approach, which helps to cure the person in a holistic way. It is a preventive therapy.

It accomplishes an all-round personality development by bringing mastery over the body, mind, intellect, & emotional faculties and is also a powerful tool to manifest those hidden potential powers in him.

The practices of the integrated approach to yoga therapy work on all sheaths and are as follows:

### **Ānandamaya Kośa**

To bring the bliss of our causal body called Ānandamaya Kośa a key given by the Upaniṣads is relaxation in all our actions. It can be brought about by:

**1.Karma yoga:** action in relaxation that is maintaining inner silence and equipoise at mental level while performing all our actions. 2. Working in blissful awareness: this approach has its roots in the Upaniṣads and ancient texts on yoga. Working without any expectation, accepting everything in life as a gift of God and total surrender to the divine, is the key to bliss. This attitude helps one to overcome ailments and brings a remarkable, change in his personality.

To bring the bliss of our causal body (Kāraṇa Īarīra) called Ānandamaya koṣa in all our actions is the key for a very happy and healthy life. This also brings our innate healing powers to effect, a complete cure of our ailments. The techniques used come under the heading Karma Yoga, the secret of action.

The secret lies in maintaining an inner silence, equipoise at the mental level as we perform all our actions. Normally we get upset, or excited over things which we do not like or we like. But we have to learn to maintain equipoise (samatva). The next step is to have a deep silence and a blissful awareness in the inner subtler

layers of our mind while we are in action. This is accomplished by self-awareness, constant drive to change oneself and auto-suggestions. To recognise that 'I am getting tensed' is the first step. Correct by withdrawing to the inner compartment of total bliss, peace and rest. Remember this by repeated inner silence several times in the day. Retain a smiling relaxed face during all the yoga practices.–

Karma yoga is a total tool for having a stress-free life. A change in attitude helps us to function better in our work environment. All the stress associated with our work environment could be handled by it. Work as worship can enhance the level and quality of our work and there by elevate our mundane day to day work to the level of spiritual enhancement. Using work as a tool for our transformation.

For more efficiency ease and effortlessness. How do we maintain peace of mind in all conditions at work. The answer is karma yoga - Peace, harmony and satisfaction.

असततं काय कम समाचर।

असतो चर कम परमा नोति पूरुषः॥

Tasmād asaktaḥ satataḥ kāryaḥ karma samācara ।

Asakto hyācarankarma paramāpnoti pūruṣaḥ ॥ gītā 3-19 ॥

**Explanation**-Therefore, perform action always without attachment. For by working without attachment a man attains the Supreme.

कम यकम यः प येदकम ण च कम यः।

स बु मा मनु येषु स यु : कृ न्नात्मकृतः ॥

Karma-yakarma ya paśyeda karma i ca karma ya |

Sa buddhiman manu ye u sa yukta k tsnakarmak t || gītā 4-18 ||

He who sees work in 'no- work' and 'no work in work', he is wise among men.

Even while doing all work, he remains established in Yoga. Karmayoga techniques are used to bring the bliss and happiness of Ānandamaya Koṣa into all activities of their daily life.

The general nature of us is that either (a) we want to escape work or (b) we get lost in work, often getting obsessed with work and turn workaholics leading to large tensions and stresses or (c) we maintain moderation in our work habits, think of helping others or involve in national constructive works or humanitarian services etc. Initially we alternate phases of relaxation, slowing, calming and silencing with work. Gradually we start learning the art of working in relaxation. As we learn the science of deeper relaxation through dynamic relaxation process as cyclic meditation, we learn the art of working in blissful awareness. The inner cleansing starts and the deep seated stresses, blocks, knots, obsessions, phobias, etc will all come out from the subconsciousness level paving way for manifestation of the divinity within us.

Hardly do we realize the importance of silence at the mental level, slowing of breath at Prāṇa level and relaxation of groups of muscles at the body level. and much less the experience of bliss. When we start understanding the role of each of the above and start using them regularly the happiness in our life starts

blossoming. The positive health can now be called blissful health. And that is the way of *Ánandamaya Koḥa*.

These techniques would help our patients with CLBP to achieve a total cognitive and physical changes at all levels. The schematic fig depicts the model of *Pratiprasava* (returning to basic nature of perfect balance) as described in yogic texts for patients with CLBP to return from painful state to complete freedom from pain and disability.

### 13.5 APPENDIX

#### DISABILITY RATING SCALE FOR LOW BACK PAIN

US English version of the **Roland-Morris disability index** from MAPI 2005

The cultural adaptation process is described in section 1.2 at the end of the questionnaire. When your back hurts, you may find it difficult to do some of the things you normally do.

This list contains some sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you today. As you read the list, think of yourself today. When you read a sentence that describes you today, mark the box next to it. If the sentence does not describe you, then leave the space blank and go on to the next one. Remember, only mark the sentence if you are sure that it describes you today.

1. I stay at home most of the time because of the pain in my back.
2. I change position frequently to try and make my back comfortable.
3. I walk more slowly than usual because of the pain in my back.
4. Because of the pain in my back, I am not doing any of the jobs that I usually do around the house.
5. Because of the pain in my back, I use a handrail to get upstairs.
6. Because of the pain in my back, I lie down to rest more often.
7. Because of the pain in my back, I have to hold on to something to get out of a reclining chair.
8. Because of the pain in my back, I ask other people to do things for me.
9. I get dressed more slowly than usual because of the pain in my back.
10. I only stand up for short periods of time because of the pain in my back.
11. Because of the pain in my back, I try not to bend or kneel down.
12. I find it difficult to get out of a chair because of the pain in my back.
13. My back hurts most of the time.

14. I find it difficult to turn over in bed because of the pain in my back.
15. My appetite is not very good because of the pain in my back.
16. I have trouble putting on my socks (or stockings) because of the pain in my back.
17. I only walk short distances because of the pain in my back.
18. I sleep less because of the pain in my back.
19. Because of the pain in my back, I get dressed with help from someone else.
20. I sit down for most of the day because of the pain in my back.
21. I avoid heavy jobs around the house because of the pain in my back.
22. Because of the pain in my back, I am more irritable and bad tempered with people.
23. Because of the pain in my back, I go upstairs more slowly than usual.
24. I stay in bed most of the time because of the pain in my back.

### **13.6 APPENDIX STAI QUESTIONNAIRE (STATE ANXIETY INVENTORY Y-1)**

#### **STAI - State**

**SELF-EVALUATION QUESTIONNAIRE**  
STAI Form Y-1

Please provide the following information:

Name \_\_\_\_\_ Date \_\_\_\_\_ S \_\_\_\_\_

Age \_\_\_\_\_ Gender (Circle) M F T \_\_\_\_\_

**DIRECTIONS:**

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

VERY MUCH SO  
MODERATELY SO  
SOMEWHAT  
NOT AT ALL

- |   |   |   |   |   |
|---|---|---|---|---|
| 1. I feel calm.....                                       | 1 | 2 | 3 | 4 |
| 2. I feel secure.....                                     | 1 | 2 | 3 | 4 |
| 3. I am tense.....  | 1 | 2 | 3 | 4 |
| 4. I feel strained.....                                   | 1 | 2 | 3 | 4 |
| 5. I feel at ease.....                                    | 1 | 2 | 3 | 4 |
| 6. I feel upset.....                                      | 1 | 2 | 3 | 4 |
| 7. I am presently worrying over possible misfortunes..... | 1 | 2 | 3 | 4 |
| 8. I feel satisfied.....                                  | 1 | 2 | 3 | 4 |
| 9. I feel frightened.....                                 | 1 | 2 | 3 | 4 |
| 10. I feel comfortable.....                               | 1 | 2 | 3 | 4 |
| 11. I feel self-confident.....                            | 1 | 2 | 3 | 4 |
| 12. I feel nervous.....                                   | 1 | 2 | 3 | 4 |
| 13. I am jittery.....                                     | 1 | 2 | 3 | 4 |
| 14. I feel indecisive.....                                | 1 | 2 | 3 | 4 |
| 15. I am relaxed.....                                     | 1 | 2 | 3 | 4 |
| 16. I feel content.....                                   | 1 | 2 | 3 | 4 |
| 17. I am worried.....                                     | 1 | 2 | 3 | 4 |
| 18. I feel confused.....                                  | 1 | 2 | 3 | 4 |
| 19. I feel steady.....                                    | 1 | 2 | 3 | 4 |
| 20. I feel pleasant.....                                  | 1 | 2 | 3 | 4 |

**SELF-EVALUATION QUESTIONNAIRE**  
**STAI FORM X-2**

NAME \_\_\_\_\_ DATE \_\_\_\_\_

**DIRECTIONS:** A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant .....	①	②	③	④
22. I tire quickly .....	①	②	③	④
23. I feel like crying .....	①	②	③	④
24. I wish I could be as happy as others seem to be .....	①	②	③	④
25. I am losing out on things because I can't make up my mind soon enough .....	①	②	③	④
26. I feel rested .....	①	②	③	④
27. I am "calm, cool, and collected" .....	①	②	③	④
28. I feel that difficulties are piling up so that I cannot overcome them .....	①	②	③	④
29. I worry too much over something that really doesn't matter .....	①	②	③	④
30. I am happy .....	①	②	③	④
31. I am inclined to take things hard .....	①	②	③	④
32. I lack self-confidence .....	①	②	③	④
33. I feel secure .....	①	②	③	④
34. I try to avoid facing a crisis or difficulty .....	①	②	③	④
35. I feel blue .....	①	②	③	④
36. I am content .....	①	②	③	④
37. Some unimportant thought runs through my mind and bothers me .....	①	②	③	④
38. I take disappointments so keenly that I can't put them out of my mind .....	①	②	③	④
39. I am a steady person .....	①	②	③	④
40. I get in a state of tension or turmoil as I think over my recent concerns and interests .....	①	②	③	④

13.7 APPENDIX

**BDI**

**BECK DEPRESSION INVENTORY**

Name : .....Date:

[On this questionnaire are groups of statement, please read Each group of statement carefully. Then pick out the one Statement in each group which best describes the way you Have been felling the PAST WEEK. INCLUDING TODAY circle The number besides the statement you picked. It several Statement in the group seen to apply equally well. Circle each one. Be sure to read all the statement in each group before making your choice.]

SL No	Option
1	a. I do not feel sad. B .I feel sad. c. I am sad all the time and I can't snap out of it. d. I am so sad or unhappy that I can't stand it.
2	a. I am not particularly discouraged about the future b. I feel discouraged about the future. c. I feel I have nothing to look forward to d.. I feel that the future to hopeless and that things cannot improve.
3	a. I do not feel like a failure. b. I feel I have failed more than the average person. c. As I look on my life, all I can see to a lot of Failures d. I feel I am a complete failure as a person.

SL No	Option
4	a. I get as much satisfaction out of things as I used to b. I don't enjoy things the way I used to. c. I can't get general satisfaction out of anything. d. I am dissatisfied or bored with everything
5	a. I don't feel particularly guilty. b. I feel guilty a good part of the time. c. I feel quite guilty most of the time. d. I feel guilty all of the time.
6	a I don't feel I am being punished. b. I feel I may be Punished. c. I expect to be punished. d. I feel I am being Punished
7	a I don't feel disappointed in myself. b. I am disappointed in myself. c. I am disgusted with myself. d. I hate myself
8	a I don't feel I am any worse than anybody else. b. I am critical of myself for my weakness or mistakes. c. I blame myself all the time for my faults. d. I blame myself for everything bad that happens
9	a I don't have thoughts of killing myself. b. I have thoughts of killing myself, but I would not Carry them out.

SL No	Option
	<p>c. I would like to kill myself.</p> <p>d. I would kill myself if I had the chance</p>
10	<p>a I don't cry any more than usual.</p> <p>b. I cry more now than I used to</p> <p>c. I cry all the time now.</p> <p>d. I used to be able cry, but now I can't cry even though I want to</p>
11	<p>a I am no more irritated now than I ever am.</p> <p>b. I get annoyed or irritated more easily than I used to.</p> <p>c. I feel irritated all the time now.</p> <p>d. I don't get irritated at all by the things that used to irritate me.</p>
12	<p>a I have not lost interest in other people.</p> <p>b. I am less interested in other people than I used to be.</p> <p>c. I have lost most of my interest in other people.</p> <p>d. I have lost all of my interest in other people.</p>
13	<p>a I make decisions about as well as I ever could.</p> <p>b. I put off making decisions more than I used to.</p> <p>c. I have greater difficulty in making decisions than before.</p> <p>d. I can't make decisions as all anymore</p>
14	<p>a I don't feel I look any worse than I used to.</p> <p>b. I am worried that I am looking old or unattractive.</p> <p>c. I feel that there are prominent changes in my appearances that make me look unattractive.</p> <p>d. I believe that I look ugly</p>

SL No	Option
15	<p>a I can work about as well as before.</p> <p>b. It takes an extra effort to get started at doing something.</p> <p>c. I have to push myself very hard to do anything.</p> <p>d. I can't do any work at all.</p>
16	<p>aI can sleep as well as usual.</p> <p>b. I don't sleep as well as I used to.</p> <p>c. I wake up 1-2 hours earlier than usual and find it.</p> <p>d. I wake up several hours earlier than I used to and get back to sleep</p>
17	<p>a I don't get more tired than usual.</p> <p>b. I get tired more easily than I used to.</p> <p>c. I get tired from doing almost anything.</p> <p>d. I am too tired to do anything.</p>
18	<p>a My appetite is no worse than usual.</p> <p>b. My appetite is not as good as it used to be.</p> <p>c. My appetite is much worse now.</p> <p>d. I have no appetite at all anymore.</p>
19	<p>a I haven't lost much weight, it any lately.</p> <p>b. I have lost more than 5 pounds I am purposely it.</p> <p>c. I have lost more than 10 pounds ing to lose weight.</p> <p>d. I have lost more than 15 pounds by eating less</p> <p>Yes    No</p>
20	<p>a. I am more worried about my health than usual.</p> <p>b. I am more worried about physical problems such as ac and Pains, or upset stomach, or constipation.</p> <p>c. I am very worried about physical problems and it It hard to think of much else.</p>

SL No	Option
	d. I am so worried about my physical problem that can't think about anything else.
21	a I have not noticed any recent change in my interest in sex. b. I am less interested in sex than I used to be. c. I am much less interested in sex now. d. b. I have lost interest in sex completely.

Total score: \_\_\_\_\_

**13.8 APPENDIX GENERAL HEALTH QUESTIONNAIRE (GHQ)**

Please read carefully.

We should like to know if you had had any medical complaints and now your health has been in general good over the past few weeks. Please answer all the questions simply by underlining the answer, which you think most nearly, applies to you. Remember that we want to know about present and recent complaints, not those that you had in the past.

It is important that you try to answer all the questions.

HAVE YOU RECENTLY:

A1 - been feeling perfectly well and in good health?	Better than usual	Same than usual	Worse than usual	Much worse than usual
A2 - been feeling in need of a good tonic?	Not at all	No more than usual	Rather more than usual	Much more than usual
A3- been feeling run down and out of sorts?	Not at all	No more than usual	Rather more than usual	Much more than usual
A4 - felt that you are ill?	Not at all	No more than usual	Rather more than usual	Much more than usual
A5 - been getting any pains in your head?	Not at all	No more than usual	Rather more than usual	Much more than usual
A6 - been getting a telling of tightness or pressure in your head?	Not at all	No more than usual	Rather more than usual	Much more than usual
A7 - been having hot or cold spells?	Not at all	No more than usual	Rather more than usual	Much more than usual
B1 - lost much sleep worry?	Not at all	No more than usual	Rather more than usual	Much more than usual

B2 – had difficulty in staying asleep once you are off?	Not at all	No more than usual	Rather more than usual	Much more than usual
B3 – felt constantly under strain?	Not at all	No more than usual	Rather more than usual	Much more than usual
B4 – been getting edgy and bad tempered?	Not at all	No more than usual	Rather more than usual	Much more than usual
B5 – been getting scared or panicky for no good reason?	Not at all	No more than usual	Rather more than usual	Much more than usual
B6 – found everything getting on top of you?	Not at all	No more than usual	Rather more than usual	Much more than usual
B7 – been feeling nervous and strung – up all the time	Not at all	No more than usual	Rather more than usual	Much more than usual
C1 – been managing to keep you busy and occupied?	Not at all	No more than usual	Rather more than usual	Much more than usual
C2 – been taking longer over the things you do?	Not at all	No more than usual	Rather more than usual	Much more than usual
C3 – felt on the whole you are doing things well?	Not at all	No more than usual	Rather more than usual	Much more than usual
C4 – been satisfied with	Not at all	No more than usual	Rather more than usual	Much more than usual

the way you've carried out your task?		than usual	than usual	than usual
C5 – felt that you are playing a useful part in things?	Not at all	No more than usual	Rather more than usual	Much more than usual
C6 – felt capable for making decisions about things?	Not at all	No more than usual	Rather more than usual	Much more than usual
C7 – been able to enjoy your normal day-to-day activities?	Not at all	No more than usual	Rather more than usual	Much more than usual
D1 – been thinking of you as a worthless person?	Not at all	No more than usual	Rather more than usual	Much more than usual
D2 – felt that life is entirely hopeless?	Not at all	No more than usual	Rather more than usual	Much more than usual
D3 – felt that life isn't worth living?	Not at all	No more than-usual	Rather more than usual	Much more than usual
D4 – though of the possibility that you might make away with yourself?	Not at all	No more than usual	Rather more than usual	Much more than usual
D5 – found at times you couldn't do anything because your nerves	Not at all	No more than usual	Rather more than usual	Much more than usual

were too bad?				
D6 – found yourself wishing you were dead and away from it?	Not at all	No more than usual	Rather more than usual	Much more than usual
D7 – found that the idea of taking your own life kept coming into your mind?	Definitely not	I don't think so	Has crossed my mind	Definitely has

A

B

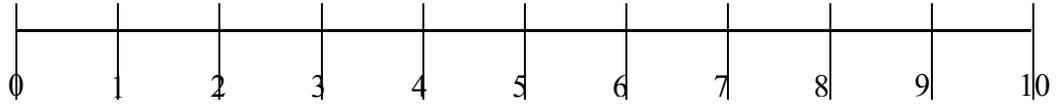
C

D

To

### 13.9 APPENDIX

## Numerical Rating Scale for Pain



No Pain

Worst Possible Pain

### 13.10 APPENDIX Daily Follow – Up Records

Symptom Score – (SS)

BACK PAIN

Name:

Age/Sex

Date:

**Instruction:** Ask for the symptoms given below using the following scores

- 0 - No symptoms
- 1 - Mild – Does not disturb the daily routine
- 2 - Moderate - Disturbs the daily routine
- 3 – Severe – Bedridden because of the pain

Date							
Day	1	2	3	4	5	6	7
1. Back Pain							
a) Location							
b) Duration							
c) Severity							
2. Aggravated by							
a) Forward bending							
b) Backward bending							
3. Side bending							
a) Right							
b) Left							
4. Straight Leg. Raising							
a) Right							
b) Left							
5. Sit and Reach							
6. Goniometer							
7. Pain analogue scale							
Total % Changes							
8. Medication							
a)							
b)							
c)							
Total % Changes							
9. Others							

## 13.11 APPENDIX

### Yoga Modules for Low Back Pain

#### Standing



## 1. HANDS STRETCH BREATHING

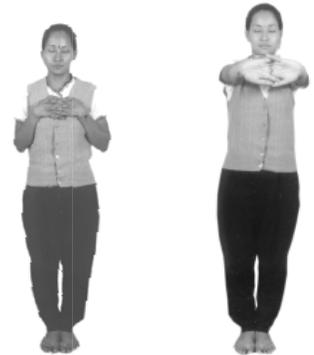
*Sthiti:Tādāsana*

*Practice*

- Stand erect with feet together (heels together and toes 4 to 6 inches apart)
- hands relaxed by the side of the body.
- Gently bring your hands in front of the chest.
- Interlock the fingers and place the palms on the chest.
- Collapse and relax your shoulders.
- Close your eyes.

*Stage1 :(Horizontal)*

- While inhaling, stretch the arms straight out in front of your body so that the arms are at shoulder level.
- At the same time twist the hands so that the palms face outwards.
- Fully stretch the arms, but do not strain.
- Now, while exhaling reverse the process and bring the palms back on to the chest.
- Collapse the shoulders again.



This is one round. Repeat 5 times.

*Stage II :(At 135<sup>0</sup>)*

- Repeat the same movements now stretching the arms in front of the forehead at an angle of 135<sup>0</sup>.



Repeat 5 times.

*Stage III :(Vertical)*

- Repeat the same movements, this time stretching the arms vertically above the head.
- While moving up and down, the palms move close to the tip of the nose.  
Repeat 5 times.

### Note

- In stage III while the arms move up and down in the same plane of the body
- The hands with crossed fingers need to move very close to the tip of the nose.
- Collapse the shoulders at the beginning and end of each cycle.
- Maintain perfect awareness of the breathing.
- Exhalation should be longer than inhalation.
- If required, it can be practiced sitting in a chair too. Properly synchronize the breathing with hand movements.

## 2. HANDS IN AND OUT BREATHING

### *Sthiti:Tādāsana*

#### Practice

- Stretch out your arms in front, in level with your shoulders and bring the palms together.
- Inhaling spread your arms sideways in horizontal plane.
- While exhaling bring the arms forward with palms touching each other.
- Repeat 5 times, making your arm movements, continuous and synchronizing with the breath flowing in and out rhythmically.



- Relax in *Tāḍāsana*. Feel the changes in the breath and the body, especially the arms, shoulders and the back of the neck

### 3. FOLDED LEGS LUMBAR STRETCH

**Type - I** (with one leg)

**Practice**

***Sthiti*: Supine Posture**



- Lie down on your back with legs together and hands spread sideways at shoulder level.
- Palms are placed firmly pressed on the ground.
- Fold the right leg at the knee, placing the right ankle by the side of the left knee.
- Inhale.
- While exhaling slowly move the right knee to the right side towards the floor, as far as comfortable and simultaneously turn the head to the left as far as you can.
- Then inhaling, raise the right knee up and turn the head back to the center.
- Now, while exhaling move the right knee to the left towards the floor and simultaneously turns the head to the right.
- While inhaling bring back the right knee and the head to the starting position (i.e to the center).
- This is one round, Repeat five rounds.
- Repeat the same on the left side i.e., with the left leg folded and right leg straight on the floor.

**Type -II** (with both legs)

Repeat as in Type -1 with both legs folded.

**Note** (For both Stages)

- While practicing with single leg folded, the leg that is straight should remain
- Undisturbed and remain perpendicular to the ground.
- Synchronize knee movement with breathing.
- Let the shoulders be firm on the ground; do not lift them during the practice.
- Be aware and concentrate on the lumbar region throughout the practice.
- While lowering the knee or knees towards right or left, feel the stretch in the lumbar region.
- You may feel the stretch in the lumbar region much more in Stage-II than Stage I.
- With continued practice, you will be able to perceive the stretch better with lesser pain.



#### 4. CROSSED LEGS LUMBAR STRETCH

**Type -I** (Right leg crossed over left leg)

***Sthiti: Supine Posture***

***Practice***

- Lie down on your back with legs together and arms spread sideways at shoulder level, palms facing down and firmly resting on the floor.
- Cross the right leg over the left by bending the legs at the knees and, wrapping the right foot around the left ankle joint.



- Inhale. While exhaling lower the knees to the right towards the floor, Simultaneously turning the head to the left.
- While inhaling bring the knees and the head back to the centre.
- Repeat the same on the left side.
- This is one round. Repeat five rounds.

**Type -II** (Left leg crossed over right leg)

***Sthiti: Supine Posture***

***Practice***

- Same as in Stage-I, except that now the left leg crosses over the right. Inhale.
- Now repeat the same. Practice 5 rounds in the same way as in Type -I.

**Note:**

- If you cannot wrap one foot around the other ankle joint, just keep one leg crossed over the other.
- You should be able to feel more stretch here than in Practice 3.

## 5. PAVANAMUKTĀSANA LUMBAR STRETCH

***Sthiti:Supine Posture.***

***Practice***

- While inhaling slowly raise the right leg up to 90<sup>0</sup>without bending the knee.
- While exhaling bend the knee, pull it towards the chest with the hands (fingers interlocked) and simultaneously raise the head trying to touch the knee with the forehead.
- Maintain for a while feeling the stretch of the back muscles.



- Then, take the head to ground.
- Inhale stretch up the right leg to 90<sup>0</sup>.
- While exhaling lower the right leg to the floor.
- Repeat the same with the left leg.
- This is one round. Repeat 5 rounds.
- Repeat the same with both legs without lifting the head.



**Note:**

- Do not bend the knee while raising and lowering the leg, .
- Synchronize perfectly your breathing with the movement.
- While touching the knee with the forehead you should be able to feel the stretch at the lumbar region.
- Do it with closed eyes and maintain awareness in the lumbar region.

## 6. SETUBANDHĀSANA LUMBAR STRETCH

### Stage-I (*Setubandhāsana* breathing)

**Sthiti:** Supine Posture

#### Practice

- Lie supine with your legs together and hands by the side of the body.
- Fold both the legs placing the heels on the ground near to the buttocks
- While inhaling raise the buttocks and the trunk up as far as you can.
- While exhaling slowly lower them down to the floor.
- This is one round.
- Repeat five rounds.



**Note:**

- Keep the hands on the ground all the time.
- Feel the stretch in the lumbar region while going up and release of the stretch while coming down.
- Synchronize the breathing with movements.

**Stage-II (SetubandhāsanaStretch)**

***Sthiti:* for Supine Posture**

- Same as in Stage-I

***Practice***

- While inhaling slowly raise the buttocks and trunk up and place the hands under the waist to support the body well.
- Then as you exhale, slowly stretch the legs forward by sliding the feet inch by inch.
- Next, while inhaling slowly bend the knees again moving the feet backward inch by inch.
- Finally, while exhaling slowly lower the buttocks and the trunk on the floor.
- This is one round, Repeat 5 times.



**Note:**

- You must have firm support of your waist in order to be able to maintain the balance.
- Initially you may feel the pain in the elbows because of the weight of the body but gradually you will get used to it.

- When you are stretching the legs forward feel the increasing stretch in the lumbar region.
- If you find it difficult to practice “*Setubāndhasana* stretch”, practice *Setubāndhasana* breathing only.

## 7. DORSAL STRETCH

***Sthiti:*** for Supine Posture.

***Practice***

- While inhaling, slowly raise the head, shoulders and body up to the dorsal part of the back, raise the arms up to shoulder level (parallel to the ground).
- Hold this position for a while.
- While exhaling come down to the floor and relax.
- Repeat the same movements five times.



## 8. TIGER BREATHING

***Sthiti:*** *Daṇḍāsana*

***Practice***

- Come to *Vajrāsana*.
- Lean forward and place the palms flat on the floor in line with the shoulders with fingers pointing forward. Arms, thighs and heels should be about



one shoulder width apart. The arms and thighs are perpendicular to the floor.

- While inhaling raise the head and look at the ceiling.
- At the same time, depress the spine making it concave.
- While exhaling, arch the spine upwards and bend the head downward bringing the chin towards the chest.
- This constitutes one round of tiger breathing.
- Repeat 5 rounds.

**Note :**

- Before starting the practice ensure that you are comfortable while standing on “all-fours” (i.e., two hands and two knees).
- Co-ordinate the movements with breathing.
- Keep the eyes closed and practice with awareness.
- Do not bend the arms or move the thighs forwards and backwards.

## 9. BHUJANĠĀSANA BREATHING

***Sthiti:*** for Prone Posture.

***Practice***

- Place the palms near the last rib bone.
- While inhaling raise the head and trunk up to the navel with minimum support of the palms.
- While exhaling slowly bring the trunk and head back to starting position.
- This is one round. Repeat ten rounds.



**c) Note:**

- If possible, keep the hands behind the back with the fingers interlocked

and do the practice. But you must not exert.

- Synchronize movements and breathing with eyes closed.

## 10. ARDHA ŚALABHĀSANABREATHING

***Sthiti:*** for Prone Posture

***Practice***

- Lie down on your abdomen, legs together, hands stretched out over the head and chin on the floor.
- Make fists of your palms with the thumb tucked inside and place them underneath the thighs.



***Type -I***(*Ardha Śalabhāsana*breathing)

- While inhaling raise the right leg up as far as comfortable without bending the knee.
- While exhaling return the right leg back on to the floor slowly.
- Repeat with the left leg in the same way.
- This is one round, Repeat ten rounds.

***Type -II***(*Śalabhāsana* breathing)

- While inhaling, this time raise both legs together as far as you can.
- While exhaling bring them back on to the floor slowly.
- This is one round.
- Practise ten rounds.



**c) Note:**

- Take firm support of your fists while raising one leg or both legs. Accordingly, place the fists so that you can take maximum support.
- Do not bend the knees at all.
- In case of *ArdhaŚalabhāsana*, the leg on the floor should be relaxed and straight.
- Do not strain or exert yourself.
- Synchronize the movement and breathing, closed eyes and breath awareness.
- Keep your eyes closed throughout the practice.

## 11. STRAIGHT LEG RAISE BREATHING

*Stage I* :Alternate legs

*Sthiti*: Supine Posture

*Practice*

- While inhaling slowly raise the right leg without bending the knee, as far as comfortable (up to 90<sup>0</sup>, if possible).
- While exhaling return the leg to the floor as slowly as possible.
- Repeat the practice with the left leg.
- This is one round. Perform 10 times.



**Note :**

- On days when the back is very painful, if you need, you can keep the arms by the side of your body with the palms facing the floor at any convenient position or at shoulder level.
- Do not bend the knee through out the practice.

- Do not disturb the leg lying straight on the ground in order to be able to raise the other leg further.
- Even if you can, do not raise the leg beyond 90°.
- Perfectly synchronize the breathing with leg movements.
- Maintain perfect breath awareness during the practice.

## 12.SIDE LEG RAISING

### *Sthithi: Supine Posture*

#### *Practice*

- Lie down on left side, with the head resting on folded left arm and support the back of the neck with the left hand.
- Place the right hand on the right thigh or in front of the chest.
- Keep the whole body as straight as possible.
- While inhaling slowly raise the right leg as high as possible without bending the knee. Stretch out the toes.
- While exhaling, slowly lower the right leg.
- This is one round.
- Repeat 5 times.
- Repeat the same practice 5 times on the left side.



**Note:**

- While raising the leg you can maintain the balance, by pressing the palm on the ground.
- Feel the strong stimulation of the lateral stretch at the lumbar region.
- In one round of practice, one provides a good stretch to the lumbar region.
- To balance the body is a little difficult in this practice. Try to get the balance by adjusting the position of the arm below the head.
- For better effect, synchronize body movements with inhalation and exhalation.

**13. Side Lumbar stretch**

***Sthiti: Supine Posture***

***Practice***

- Lie down on the left side of the body.
- Hold the back of the neck with the left hand.
- Bend the right leg at the knee and hold the right ankle with the right hand behind the buttocks.
- While inhaling move the right thigh backwards



as for as possible by pulling the right foot with the right hand and at the same time, bend the head backwards arching the spine, keep the hand straight.

- While exhaling bring the right thigh forward on the chest with the knee bent and right hand holding the right ankle.
- Bend the head forward in the *Pavanamuktāsana* style trying to touch the forehead to knee. This is one round.
- Repeat five rounds.
- Repeat the same on the other side.

#### 14.12 Appendix Raw Data

PR_BY	PR_AY	SYS_BY	SYS_AY	DIA_BY	DIA_AY	RR_BY	RR_AY
105	98	110	106	70	68	15	18
80	74	130	120	80	70	24	18
84	80	130	128	90	80	18	14
88	85	130	110	60	70	18	18
74	68	112	110	70	68	19	14