

**ELECTRODERMAL STUDY OF ACUPUNCTURE MERIDIAN
ENDPOINT ENERGIES IN HEALTH AND VARIOUS
CONDITIONS INCLUDING TYPE 2 DIABETES MELLITUS**

Thesis submitted by
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Submitted to



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

a	=	अ	ña	=	ञ	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	=	ध	tra	=	त्र
kha	=	ख	na	=	न	jña	=	ज्ञ
ga	=	ग	gha	=	घ			

ABSTRACT

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) constitutes 95% of all diabetes incidence. The greatest increase between now and 2030 will be in India, from 19.4 to 57.2 million. Yoga constitutes one of India's many priceless gifts for its management, of perennial value to the human family. New methods for tracking subtle changes that occur at the psychological and prana levels before the disease sets in may go a long way to preventing it. They include tools like Gas Discharge Visualiser (GDV) and AcuGraph Digital Meridian imaging system. AcuGraph is an instrument specially designed for electrodermal measurement of meridian bio-impedance. Its particular use for the assessment of T2DM is the subject of this thesis. These instruments bring better understanding of how Yoga can manage, prevent and "Stop Diabetes"!

LITERATURE REVIEW

Reviewing the literature establishes both a theoretical framework, and guidelines for, empirical research on the concept of *prāṇa* at the *Pranamaya Kośa* level. *Ādhi* in the *ManomayaKośa* can lead to *Vyadhi* at *Annamaya Kośa* level, caused by disturbances at the *PrāṇamayaKośa* level. The scientific literature review documents the scope of preliminary AcuGraph studies of various pathologies including T2DM, their use to assess different mind body interactions, and their significant findings in the field of Yoga medicine.

AIM AND OBJECTIVES

The aim of the study was to examine the efficacy of IAYT on DM and Industrial Managers and Executives using AcuGraph.

The objectives were:

1. To compare T2 DM and Normal healthy subjects.
2. To compare Industrial Managers and Normal healthy subjects.
3. To compare HIV infected children and Non-infected children.
4. To compare Depression and Normal healthy subjects.
5. To examine whether changes in Acugraph readings in T2DM patients following IAYT indicate movement towards normalcy.
6. To examine whether the changes in Acugraph readings in Managers following SMET indicate movement towards normalcy.

METHODS

DESIGN

Two study designs were used: two group cross-sectional design for the Baseline comparisons of Type 2 DM, Managers, HIV, Depression with their respective Normal healthy groups. Pre-post design was adopted for Acugraph Assessment of the effect of IAYT on Type 2 DM and the effect of Stress Management of Executive Tension (SMET) on Managers.

SUBJECTS

For Baseline comparison of Type 2 DM and Normal healthy 130 participants with Mean Age \pm S.D, 58.52 ± 11.15 were compared with 85 'healthy' adults with Mean Age \pm S.D, 47.39 ± 10.48 . For Baseline comparison of Managers / Executives with their Normal

healthy group, 45 Managers with Mean Age \pm S.D, 52.14 ± 8.67 , were compared with 55 normal healthy Mean Age \pm S.D, 44.04 ± 8.62 . For the comparison of HIV infected children with non-infected children, the study assessed 43 HIV infected children Mean Age \pm S.D, 10.55 ± 2.97 and 36 non-infected children Mean Age \pm S.D, 11.25 ± 2.36 . For comparison of Depression and Healthy subjects, 27 Depression patients Mean Age \pm S.D, 34.95 ± 8.25 were compared with 43 'healthy' with Mean Age \pm S.D, 40.72 ± 8.63 . For the Pre-Post Assessment of 7 & 14 day Yoga Interventions for Type 2 DM, the 7-day Yoga intervention study assessed 70 participants with mean age \pm S.D, 57.10 ± 10.86 , while the 14 day Yoga intervention assessed 60 participants with mean age \pm S.D, 59.07 ± 11.18 years. For Pre-Post Acugraph Assessment of SMET for Managers used 45 ONGC executives with mean age \pm S.D, 54.27 ± 4.32 years.

Assessments included Acugraph variables as primary measures, and diabetes markers, fasting blood sugar, post prandial blood sugar, systolic and diastolic blood pressure as secondary ones.

Data Extraction and Analysis: used Acugraph computer software, and SPSS 16.0 statistical package for social service for data visualization, and generation of figures and tables.

RESULTS

Main results of the studies were as follows:

1. Baseline comparison of Type 2 DM and Normal healthy on Acugraph

Acugraph measures for the Type 2 DM and Normal Healthy groups and their statistical comparison. Results were significantly different $p < 0.001$ for all the lower meridians, and in two upper right side meridians.

2. Baseline comparison of Managers and Normal healthy on Acugraph

The managers showed a very low range of mean values in their meridians compared to Normal healthy group, p values <0.001 for all 24 meridians; however, there were no significant Upper-Lower or Left-Right imbalances like those in the T2DM group.

3. Baseline comparison of HIV infected children and non-infected children on Acugraph

HIV children showed lower readings on *all* meridians than the normal children, despite two not reaching t test significance.

4. Baseline comparison of Depression and Healthy subjects on Acugraph

Group SDs for the Depression group were very high, while those of the No Pathology group were far lower. Differences between mean energy levels were highly significant on all meridians.

5. Pre-Post Acugraph Assessment after 7 & 14 days Yoga Intervention for Type 2 DM

The two studies suggest that U_L balance can be restored by Yoga therapy practice, but this needs further confirmation, as may the possibility that autonomic balance may also result from bringing upper and lower meridians into balance.

6. Pre-Post Acugraph Assessment of SMET for Managers

Energy Levels in most were far lower than is desirable even after the intervention, suggesting that a longer intervention is needed for modern executives. The uniform increases observed over a range of initial values support this idea. Longer interventions might also show significant changes in the various combination variables that did not reach significance.

CONCLUSIONS

1. Baseline established for Type 2 DM, Managers, HIV children, depression.
2. Integrated Approach of Yoga Therapy is effective for Type 2 DM.
3. Five days of SMET program can increase energy levels in Managers.

Electrodermal skin conductance measures at acupuncture points vary considerably in different populations: Type 2 DM, Managers, HIV +ve children, depression people all showed different patterns of Qi energy. AcuGraph can therefore be used to identify specific patterns of subtle energy at acupuncture points associated with different populations and different diseases, as well as different subtle energy changes resulting from different Yoga interventions, those reported being here being for T2DM and Managers. This points the way to identifying Yoga or other CAM modalities most appropriate for different rehabilitation requirements.

Overall the work presents a bridge between ancient Indian medicine and Traditional Chinese Medicine (TCM), particularly between the Chinese concept of Qi and the Indian concept of *prāṇa* (vital force). It demonstrates that TCM principles can also be tested. The research protocols appear suitable for further research on energy-based models of disease.

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CHAPTER – 1

INDRODUCTION

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1.0 INTRODUCTION

The global epidemic of non-communicable diseases (NCDs) is now widely acknowledged as a major 21st century development challenge, and a significant threat to achieving internationally agreed development goals (UN General Assembly, 2011). Currently, non-communicable diseases (NCDs) are responsible for almost two-thirds of all deaths globally. Of the 57 million global deaths in 2008, 36 million, or 63%, were due to NCDs, principally cardiovascular disease, diabetes, cancers and chronic respiratory diseases. These four groups of diseases share more or less the same risk factors (tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol). As their impact increases, and as the world's population ages, annual NCD deaths are projected to continue to rise worldwide.

Type 2 Diabetes Mellitus (T2DM) is a metabolic disorder characterized by hyperglycemia, abnormal lipid and protein metabolism, and long term complications affecting the retina, kidney, and nervous system (Qureshi, Asad, & Sultana, 2009). Many health and advocacy groups regard T2DM as a growing worldwide epidemic (WHO, 1999). The World Health Organization (WHO) estimates that it will be one of the world's leading causes of death and disability within the next quarter century. Statistics are grave: in 1985, 30 million people worldwide were diagnosed as having diabetes; by 1995, the number had risen to 135 million; WHO predicted that, by 2025, there will be some 300 million (American Diabetes Association, 1999), but numbers have risen even faster.

Currently, there are more than 17 million T2DM patients in the United States, 11 million in Europe, and 6 million in Japan. In 1997, the American Diabetes Association (ADA)

reported the total economic cost of the condition in the US alone to be \$98 billion in direct medical and treatment costs, and \$54 billion in indirect costs related to disability and mortality. The prevalence of all form of diabetes is estimated to be 2%-3% of the world's population, and to be increasing by 4%-5% per annum. Clearly the problem needs urgent attention. Complementary Medicine has much to offer, though this is not often realized by the medical profession. Yoga in particular has been shown to provide good benefits, as seen in the following diagram (**Figure 1**).

Fig. 1: Effects of Yoga on Type 2 Diabetes Mellitus

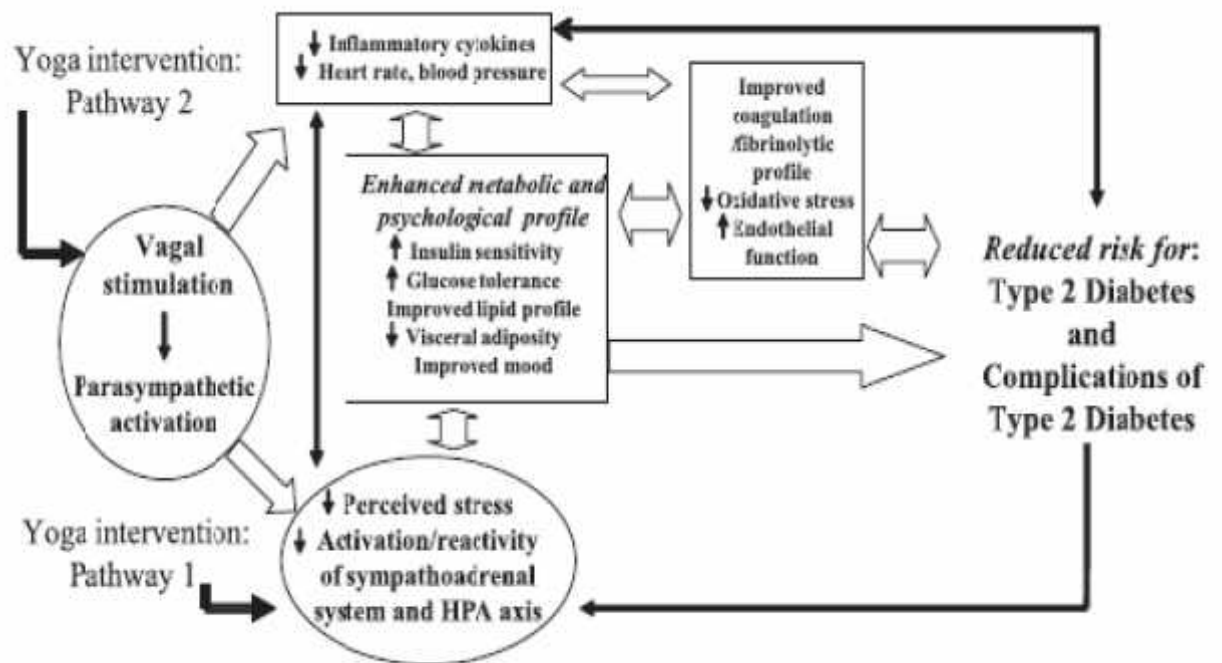


Figure 1 Caption: Figure 1 depicts two possible pathways helping Type 2 Diabetes resulting from general Yoga interventions. Pathway 1 concerns decrease in sympathetic nervous system activation while Pathway 2 concerns possible increases in parasympathetic nervous system activity resulting from vagal stimulation (Malhotra, Singh, Tandon, & Sharma, 2005).

The Integrated Approach to Yoga Therapy (IAYT) has been shown to be highly effective in both health and disease. It can improve both positive and negative emotions in healthy subjects (Narasimhan, Nagarathna, & Nagendra, 2011). Yoga can control both symptoms and complications associated with T2DM, and help regulate body functions and psychological processes, improving levels of well-being and caring attitudes (Malhotra, Singh, Tandon, & Sharma, 2005). Biological mechanisms have been suggested, linking benefits of yoga to diabetes management (Sahay, 2007). Identifying diabetes conditions at the *Prāṇamaya Kośa* (vital force) level before they percolate to the physical (*Annamaya Kośa*) level can then ensure that yoga reverses effects of Type 2 Diabetes Mellitus, and other psychosomatic ailments.

1.1 TRADITIONAL MEDICINE

1.1.1 Energy Medicine Approach

Traditional Chinese Medicine (TCM) gives detailed descriptions of the essential life force or vital-energy, which it names Qi, see e.g. The Yellow Emperor's Classic of Internal Medicine (Veith, 2002). In this, it is entirely parallel to the ancient Indian system which names the vital-breath, *Prāṇa* (Chinmayananda, 1988). Both systems hold that Qi / *Prāṇa* is present throughout the cosmos and in every living creature, constantly moving and changing. Qi/*Prāṇa* enters the body mainly in food and with the breath, after which it is extracted and circulated throughout the body along specific pathways called meridians / *nādis*. TCM focuses on a set of 12 pairs of meridians (one on each side of the body) that link a specific organ, e.g. liver or kidney, with a sequence of points on the surface, where treatments like acupuncture can be administered. The meridians form channels of

communication between the vital organs and their acupuncture points. As long as Qi can flow freely through a meridian, its organ remains healthy. Blockages result in development of pathology and pain.

Systems of medicine which act on Qi / *prāṇa* are known as energy medicine (EM). Their aim is to maintain balance of energies between different meridians, and increase levels of life energy, Qi / *prāṇa*. From a more conventional, biochemical perspective, energy medicine can be considered to indirectly regulate psycho-neuro-endocrinological (PNE) processes. EM covers a range of practices that aim to stimulate the human body's energy field through various techniques, thereby promoting healing and maintaining wellness.

The concept that Qi/*Prāṇa* energy exists and moves, and that health is homodynamic, form the core assumptions of popular energy medicine practices like acupuncture and Yoga. These assumptions lead logically to practice characteristics that distinguish energy medicine from materialist medicine. Yoga is considered to bring about mind-nervous system (PNE) regulation – one way that it helps Diabetes patients restore their overall systems to normal (Figure 1, Pathway 2). Another is to replace unhealthy diet and life style practices that triggered disease with healthy practices. Both contribute to the patient regaining normal health (Pathways 1 & 2).

1.2 PSYCHOSOMATIC DISORDERS

The *Yoga Vāsiṣṭha* (Ravi, 1998), an ancient Yoga Text, describes the origin and cure of mental and bodily diseases. Sage *Vasishtha* teaches Lord Rama that there are two major classifications of disease: those caused by the mind are primary (*ādhija vyādhi* or

psychosomatic, stress-related disorders) while those that afflict the body directly are secondary (*anādhija vyādhi*, infectious disease, accidents etc). Primary diseases have two sub-divisions, *Samānya*, or ordinary physical diseases, and *Sara*, the disorder of tendency to rebirth that can only be destroyed by *atma jnana*, knowledge of the Divine Self. *Samānya* diseases are ones that affect us physically and may be destroyed by the restoration of mind-body harmony. In such psychosomatic disorders, application of Yoga practices as a mode of therapy can be very practical and useful.

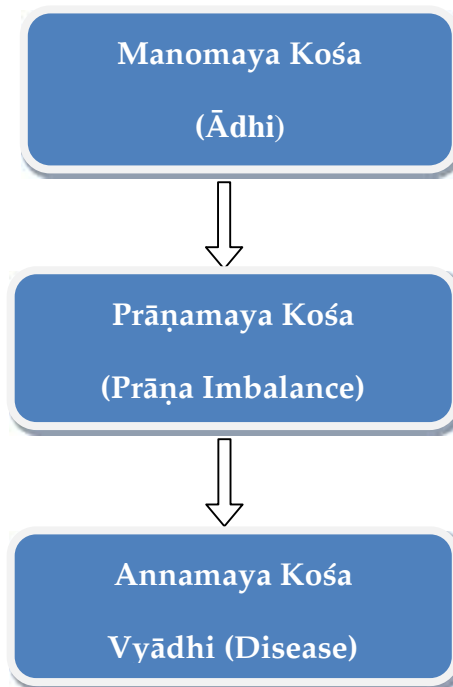


Fig. 2: Ādhi leads to Vyādhi

1.3 NEED FOR THE STUDY

How Yoga therapy relieves patients' stress-borne diseases is only partially understood. The need is to understand mechanisms by which the subtle energy supports normal physiological and psychological processes. This thesis describes studies conducted to evaluate efficacy of IAYT, which is based on the principle of healing through mind/body medicine, through the concept of *Pancha Kośas* from *Taitriya Upaniśad* (Sharvananda, 1928). There are five layers of human existence, *Annamaya Kośa* the physical body, which needs nourishment to survive, *Prāṇamaya Kośa* the vital shell that is full of life, *Manomaya Kośa*, *Vijnānamaya Kośa*, *Ānandamaya Kośa*. IAYT usually begins by promoting the physical (*Annamaya Kośa*) and mental (*Manomaya Kośa*) levels. It uses the vital force (*Prāṇamaya Kośa*) as a bridge between the two, and the intellectual level (*Vijnānamaya Kośa*) to develop better ways of coping with stress. Ultimately the blissful state of the *Ānandamaya Kośa* is drawn on to provide permanent cure. The present study originated in the idea that regulation of vital force, *Prāṇa* / Qi (Indian / Chinese) at the *Prāṇamaya koshā* level by Yoga life-style can restore balance before imbalances permeate to the *Annamaya Kośa* level i.e. the physical body. Though the *prāṇa sharira* (vital energy body) can move and act without the material body, it uses the latter for its expression in the physical world. In fact, the physical body is just an outer instrument, built and shaped by the *prāṇa*, on which it depends completely. The *prāṇa* is in turn

modified by the *manas*, which is one vehicle for the mental spirit, or in other words a person's mental make-up is in command of their *prānic* body.

Electrical measurements at acupoints provide a basis for assessing organ function. A recent review by Ahn et al (Ahn & Martinsen, 2007) included nine studies that explored acupuncture sites and nine studies that explored the existence of a meridian system. They stated that five of the nine studies showed positive association between lower electrical resistance and acupuncture points, and seven of the nine showed positive association between acupuncture meridians and lower electrical impedance and higher capacitance. They said that quality of the research in the area is poor, and that evidence for acupuncture points and meridians being electrically distinguishable is inconclusive. However the interaction and trend to biological pattern for particular population can be studied (Ahn et al., 2008). The skin's electrical resistance is affected by many factors including age, gender, skin humidity, room temperature, external stimulus, etc (Boucsein, 1993). Pressure applied between electrode and skin is also known to affect skin resistance considerably. The present study aims to identify interactions between the *Prāṇamaya kosha* and *Annamaya kosha* in order to help understand these variations better.

1.4 SCOPE OF THE STUDY

The proposed study aims to provide unique insight into yogic mechanisms of disease prevention and cure at the subtle level, using electrodermal skin conductance measurements. Acugraph measures show that the Integrated Approach to Yoga Therapy (IAYT) can cause changes in electrodermal conductance at acupoints in Type 2 Diabetes patients. Such conductances are held to assess Qi in the Chinese system and *Prāṇa/Shakti*

in the Indian system. The study first describes the effect of 7 days and 14 days Yoga therapy on electrodermal resistances, and then on secondary variables. Several other intervention and comparison studies are shown to provide new output into the field of Yoga and Bio-energy.

CHAPTER – 2

LITERARY RESEARCH

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2.0 LITERARY RESEARCH

2.1 AIM

- To investigate *prāṇa* imbalances caused by *ādhi*.
- To elucidate the structure of imbalances in *prāṇa* and its 5 components – the 5 *vāyus* and their locations.
- To understand mechanisms by which the above imbalances develop in the body.
- To understand various aspects of *prāṇa* according to different texts.

2.2 OBJECTIVES

- To compile the concept of *prāṇa* and its relation with diseases.
- To understand how to remove *prāṇa* imbalance caused by *ādhi*.
- To compile and understand concepts associated with *prāṇa*: its functions and locations according to yoga and spiritual lore.
- To understand the concepts of *prameha* disease in *āyurveda*.

2.3 METHODOLOGY

Sources

1. *Āyurveda* texts- *Charaka Saṁhitā*, *Ashtanga Hridaya* etc.
2. Yoga Texts- Various - *Shiva Sutra*, *Yoga Vasīṣṭha*, *Viveka chudamani* etc.
3. *Upanishad*- *Brhdaranyaka Upanishad*
4. Modern Texts- *Art of Prāṇayama*, *Yoga for Positive Health Promotion* etc.
5. Internet Sources.

Classical, authentic information was derived from verses, commentaries and descriptions about the concepts of *prāṇa*, *prameha* and different forms of concentration and attention from the above sources. The information was first systematically compiled and then sorted out according to the defined structure of the sections. The original *ślokas* in *sanskṛta*, transliteration in the standard international codes and meaning are presented first. Then the special features of the *ślokas* are explained based on relevant commentaries. Relevant references are cited in the body of the text as well as in the reference section.

INCLUSION CRITERIA

As the search results were large and texts were varied, we focused on verses that had *prāṇa* and concepts of health and disease in terms of *prāṇa* imbalance caused by *Ādhi* and its functions. *Prameha /Madhumeha* are also included in the study.

EXCLUSION CRITERIA

Verses were excluded if they merely conceptualized *prāṇa*, even though they offered rich sources of information. For our needs, restricting to other texts served all practical purposes. Inclusion of all *ślokas* from one text was not attempted.

2.4 WORKS DONE EARLIER

Many studies concerning the subtle body and the concept of health and disease have been completed i.e *prāṇa*, *prāṇa* imbalance due to *Ādhi* and *prameha/Mdhumeha* and the concept of Health and Disease.

In this M.Sc. dissertation, attitude has been analyzed using the concept of *prāṇa* from the view point of *Atharvaveda*, *Samkhya* and *Ayurveda* in which the spectrum and manifestation of *prāṇa*, in different world, beings, species, and *slokas* are explained. *Marmas* form seats of the life force, *Prāṇa* (Lokesh, 2003) (Shruddha, 2004) tried to find correspondences between the concepts of nadi in the Indian system, and meridian and in the Chinese system. Correlations were listed between various aspects of nadi and meridian.

The study by (Meenakshy, 2009b; Singh, 2009a; Nagilla, 2012; Choudhary, 2013) tried to survey the correlation, characteristics, from ancient Yogic texts and their relation to Traditional Chinese Medicine were explained. Being grosser or subtler and beyond purified and unpurified were identified as characteristics of *prāṇa*.

A comprehensive study (Sharma, 2012), showed parallels and contrasts between these principles in Indian and Chinese systems, treating the concept of Marma in *Su ruta Samhitā* and *Vāsiṣṭha Samhitā* extensively, explaining how these sites are seats of *prāṇa* and that injuries to them can prove fatal.

Eight literature reviews have been carried out on the relationship between *prameha* and *madhumeha* (Rani, 2003). Neha (2013) surveyed the causation, symptoms, management and pathogenesis, which apply not only to diabetics but every individual and help them realize the importance of adopting the healthy life style including proper diet, sleep and exercise required to manage *prameha*. Here an integral regimen of *Yoga* and *Āyurveda* were used for the prevention and management of Diabetes.

In his master's dissertation (Pradeep, 2013) summarizes how patients are advised to avoid intake of food containing excess salt, sour, sweet, dairy products, or alcohol; food made of new grains is advised, also fresh vegetables, fruits, Bitter gourd, etc focusing on maintaining balance in the three doshas, *vata*, *pitta*, and *kapha*.

An MD dissertation (Amit, 2014) failed to find correlations between *p rvar pa* of *prameha* and modern pre-diabetes symptoms. No reference was found for use of nadi pariksha to diagnose pre-diabetes stage during *p rvar pa*. Arun, (2014) noted that Naturopathy emphasizes simple, clean, active lifestyles in conjunction with natural laws of health, and how its proponents commonly view diabetes not as a separate disease entity, but as a byproduct of wrong ways of living, that finally afflict the system. In one study by (Kumar, 2014), certain *upadrava* matched several complications of modern day diabetes, for some of which no equivalent complications in modern understanding could be identified.

Another MD dissertation (Ramachandra, 2014) tried to identify human energy field characteristics correlating with *Prabha* in relation to Diabetes (*Madhumeha*) explaining that bad *ahaara / vihaara* routines lead to *ojokshaya*. Vitiating *Vata dosha* takes *ojas* to *basti* (Urinary tract) leading to *madhumeha* (diabetes). Lack of immunity in the multisystem level of the body leads to decrease in *Prabha* Human Energy Field.

Bhawna (2014) states that urinary clinical manifestations form the common ground of *Prameha* and *Madhumeha*, but associated problems of digestion, eyes, ears, teeth; throat, buccal cavity and weakening of the nervous system distinguish different kinds of *Prameha*. An aggravated condition of both *Vy na* and *pana v yus* may produce

Prameha. If these manifestations of *Prameha* are not treated properly, they will progress into diabetes.

The study suggested by Jayalaxmi (2005) and Saini (2011) concepts of *dhi* and *vy dhi* is essential for healthy life style as disease starts from mental disturbances. In contrast, proper channelization and use of *prāṇa* leads to positive health and develops highest human potential.

Table 1: Summary Table of Previous Work

Author & Year	Summary	Strength	Limitations
Concept of <i>Prāṇa</i>			
Lokesh, 2003 (M.Sc. Dissertation)	<ol style="list-style-type: none"> 1. Spectrum and manifestation of <i>prāṇa</i>, in different world, beings, species, <i>lokas</i> are explained. 2. Two basic aspects of <i>prāṇa</i> are un-manifest and manifest. 3. <i>Prāṇa</i> or vital force is a modification of air element. 	<ol style="list-style-type: none"> 1. Detailed and comprehensive explanation of <i>prāṇa</i>. 2. Manifestations of <i>Prāṇa</i> in different <i>lokas</i> are explained. 3. Concept of <i>prāṇa</i> in grate details <i>explained</i> in <i>Athervaveda, samkhya, Ayurveda</i> are done. 	<ol style="list-style-type: none"> 1. No theoretical model. 2. Did not explain definition of <i>prāṇa</i> and from yoga philosophical texts.
Shruddha, 2003	<ol style="list-style-type: none"> 1. Chinese medicine proposes that 	<ol style="list-style-type: none"> 1. Explained <i>Prāṇa</i> in contrast to channel as 	<ol style="list-style-type: none"> 1. No theoretical model.

	<p>there are current of energy in the body, called meridians that are modulated by the effects of yin and yang, and influenced by environmental and emotional effects.</p>	<p>Nadi were explained in details.</p> <p>2. The study reviewed both the Chinese as Indian text has been done.</p>	<p>2. Experimental work is Different from literary search.</p>
<p>Meenakshy, 2009; Nagilla, 2012; Singh, 2009 (M.Sc. Dissertations)</p>	<p>1. There are few correlation found between two concept.</p> <p>2. <i>Chakra</i>: centres of <i>akti</i> which influence physical, mental and supra mental states.</p> <p>3. <i>yogic</i> concepts of subtle body to similar concepts in TCM.</p>	<p>1. Correlation between <i>prāṇa</i> in Indian and Qi in Chinese and nadi /meridian are discussed.</p> <p>2. Correlation between Yin/ Ida and Yang/ <i>pingala</i> correlation are discussed.</p> <p>3. The <i>prāṇa</i> and Qi comparison had been done.</p>	<p>1. No theoretical model.</p> <p>2. Detailed explanation has not done regarding the Yoga and TCM concept.</p>

<p>Sharma, 2012 (Seminar Report)</p>	<ol style="list-style-type: none"> 1. <i>yurveda</i> and Yoga concept of <i>Marmas</i>: definition, types, locations are done in detailed. 2. Detailed information on correlation between <i>prāṇa</i> and Qi; <i>Nāḍīs</i> and meridians; <i>Chakras</i> and dentians; <i>Marma</i> and acupoints. 	<ol style="list-style-type: none"> 1. Detailed review of verses relevant to <i>Marma</i>. 2. Indian and Chinese concept of the subtle body is explained. 3. Important Yoga and <i>yurveda</i> texts were referred 	<ol style="list-style-type: none"> 1. No theoretical model proposed.
Concept of Prameha/ Mdhumeha			
<p>Pradeep, 2013</p>	<ol style="list-style-type: none"> 1. Madhumeha in Ayurvedic text is equivalent to DM in modern medical science. 2. The root word and characteristics of prameha has been explained. 	<ol style="list-style-type: none"> 1. Detailed and comprehensive explanation <i>Paribhasha</i> of prameha has been explained. 	<ol style="list-style-type: none"> 1. Experimental work is Different from literary search.

Usharani, 2009	1. Importance of adopting a healthy life style with proper diet, sleep and exercise which play important role in preventing <i>prameha</i>	1. Causation, symptoms and pathogenesis of diabetics or any individual has explained.	1. No theoretical model Proposed. 2. Detailed study has not done.
Bhawna, 2012	1. Prameha, not properly treated and attended to at the outset, may ultimately develop into Diabetes, which is incurable.	1. Prameha, the precursor of Diabetes Mellitus from the perspective of <i>Prāṇa</i> in refer to <i>Su ruta Samhitā- Nidānasthānam</i> has referred in details.	1. No theoretical model Proposed.

Amit, 2013	<ol style="list-style-type: none"> 1. No correlation between <i>pūrvarūpa</i> of prameha and modern pre-diabetes symptoms. 2. <i>Kara d ha</i> and <i>p da d ha</i> mentioned as <i>p rvar pa</i> of <i>prameha</i> can be correlated to skin itching/burning sensation of feet and palm. 	<ol style="list-style-type: none"> 1. Purvarupa of prameha or premonitory 2. Symptoms of <i>Madhumeha</i> explained. 3. Comparison between p rvar pa of prameha and symptoms of pre-diabetes are detailed. 	<ol style="list-style-type: none"> 1. No theoretical model Proposed.
Vinod, 2014	<ol style="list-style-type: none"> 1. <i>Upadravā</i> /complications of the diabetes and its correlation with complications according to modern medicine understanding. 	<ol style="list-style-type: none"> 1. It was possible to correlate majority of <i>upadrava</i> with modern day understanding of the disease. 2. Study could find that certain <i>upadrava</i> were matching with several complications of 	<ol style="list-style-type: none"> 1. No theoretical model has not done since the experimental part was on development and validation of yoga module for type 2 DM.

		modern day.	
Ramachandra, 2014	<ol style="list-style-type: none"> 1. <i>Ojas</i> the essence of all <i>Dhatu</i> (essential tissues) is responsible for construction of <i>Vyadhikshamatwa</i>. 2. Aetiology, Pathogenesis Treatment etc are summarized. 	<ol style="list-style-type: none"> 1. Correlation to <i>Prabha</i> as explained in classical texts and to explore relations with Diabetes (<i>Madhumeha</i>) as per the classical Ayurveda and yogic texts are studied. 	<ol style="list-style-type: none"> 1. Only Commentary of <i>Chakrapani</i> text referred.
Arun, 2014	<ol style="list-style-type: none"> 1. Treatment modalities and scope of treatment correlating it with the <i>yurveda</i>, <i>Yoga</i> and Modern Medicine as reviewed. 2. Lack of activity and sedentary lifestyle as an important etiology for the development of disease. 	<ol style="list-style-type: none"> 1. Concept of health in naturopathy and its correlation with other holistic system of medicine has been explained. 2. Concept of diabetes according to naturopathy are Explained. 	<ol style="list-style-type: none"> 1. No <i>slokas</i> included about Yogic concept and naturopathy.

Neha, 2013	<ol style="list-style-type: none"> 1. <i>Yoga</i> and <i>Āyurveda</i> been used as an Integral part of <i>Āyurveda</i> regimen for the prevention and management of Diabetes 	<ol style="list-style-type: none"> 1. <i>Nidāna</i> Is the Etiology of Disease Has Been Discussed. 2. Detailed study has been done on yoga practices recommended by classical yoga texts. 	<ol style="list-style-type: none"> 1. No theoretical model Proposed. 2. Detailed explanation on Child born as <i>Madhumehi</i> has not explained.
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2.5 TEXT-WISE PRESENTATION OF VERSES RELATED TO PRĀṆA

In ancient times, Indian philosophy considered the entire universe to be made up of two aspects *Akasa* and *prāṇa*: the power which motivates and activates *Akasa* into creating and dissolving the universe (Nagendra, 1999).

Prāṇa is the vital force which sustains life. It flows through subtle channels (*Nāḍīs*) in the body. It is also identified as ‘vital energy’ that makes everything happens in the universe. *Prāṇa* is a central concept in *Āyurveda* and was first elaborated in *Praśnopaniśad*.

प्राणस्येदं वशे सर्वं त्रिदिवे यत्प्रतिष्ठितम् ।

मातेव पुत्रान् रक्षस्व श्रीश्च प्रजां च विधेहि न इति ॥ (प्रश्न २- १३)

Prāṇasyedaṁ vaśe sarvaṁ tridive yatpratiṣṭhitam |

Māteva putrān rakṣasva śrīśca prajāṁ ca vidhehi na iti | |

All that exists in the three worlds is under the control of *Prāṇa*. O *Prāṇa* (please) protect us, our children, as our mother, and grant us wealth and wisdom.

Praśnopaniśat, 2.13

This is the most comprehensive definition of *Prāṇa* found in *upāniśadic* and *Yoga* lore. as the relative world.

The term *Prāṇa* can be further classified into five *Prāṇa* is the force that stimulates the Absolute to manifest subcategories, called the *Pancha prāṇas*. According to the Vedic

system, these are vital principles controlling the basic energy and subtle faculties of the organism, which sustain physiological processes. The five *prāṇas* or vital currents are: *Prāṇa*, *Udāna*, *Samāna*, *Apāna* and *Vyāna*. They constitute the second sheath surrounding the essence – the *Atman* or Self (Nagendra, 1999).



Fig: 3 Panca Kośa with special reference to *Prāṇamayakōśa*

PRĀṆA ACCORDING TO PRAŚNOPANIṢAT

Origin of *Prāṇa*

A student asks the teacher as to the origin of *prāṇa* as follows:

भगवन् कुत एष प्राणो जायते कथं आयात्यस्मिञ्शरीर

आत्मानं वा प्रविभज्य कथं प्रातिष्ठते केनोत्क्रमते कथं बाह्यमभिधत्ते कथंध्यात्ममिति ॥

Bhagvan kuta eṣa prāṇo jāyate katharṁ āyātyasmiñśrīra

Ātmānarṁ vā pravibhajya katharṁ prātiṣṭhate kenotkramate katharṁ bāhyamabhidhatte

katharṁ adhyātmamiti.

“O venerable sir, from where is this *prāṇa* born? How does he come into this body? How again does he dwell by dividing himself? How does he depart? How does he support the external things and how the physical things?”

Praśnopaniṣat, 3.1

आत्मन एष प्राणो जायते ।

यथैषा पुरुषे छा्यैतस्मिन्नेतदा ततं मनो कृतेनायात्यस्मिञ्शरीरे ॥

Ātmana eṣa prāṇo jāyate,

Yathaiṣā puruṣe chāyaitasminnetadā tataṁ mano kṛtenāyātyasmiñśarire.

“From the Self is born this *prāṇa*. Just as there can be this shadow when a man is there, so this *prāṇa* is fixed on the self. He comes to this body owing to the actions of the mind.”

Praśnopaniṣat, 3.3

PRĀṆA ACCORDING TO YOGA VĀSIṢṬHA

देहेऽस्मिन्देहनाडीषु वातः स्फुरति योऽभितः ।

स्पन्देष्विव भुवो वारि स प्राण इति कीर्तितः ॥

Dehe'smindehanāḍīṣu vātaḥ sphurati yo'bhitaḥ,

Spandeṣviva bhuvo vāri sa prāṇa iti kīrtitaḥ.

“There is a circulating air breathing through the lungs and arteries of the body, as the water flows through the veins and power of the each, which is called the vital breath of life.”

Yoga Vāsiṣṭha, 5.91.10

प्राणाधीनपरिस्पन्दं चित्तं आहुः मनीषिणः ।

तस्मिन् संरोधिते नूनं उपशान्तं भवेत् मनः ॥४५॥

Prāṇādhīnaparispandam cittam āhuḥ manīṣiṇaḥ|

Tasmin sanrodhite nūnam upāśāntam bhavet manaḥ||45||

Wise man call the *Prāṇa* as having the movement dependent on *Prāṇa* (or vital air or bio-energy). When that *Prāṇa* is controlled, the mind certainly become tranquil.

Yoga Vāsiṣṭha, 17.3.45

यध्यन्तः मारुतो रुद्धः व्याधिः जन्तो न जायते ॥ ३० ॥

देहदुःखं विदुः व्याधिं आध्यख्यं वासनामयम् ।

Yadhyantaḥ māruto rudvaḥ vyādhiḥ janto na jāyate|| 30||

Dehaduḥkham viduḥ vyādhim ādhyakhyam vāsanāmayam|

If the vital air is bound with in, physical ailment is not produced in a living being. The distress of the body is known as physical disease. Mental affliction consists of mental impressions (or knowledg derived from memory agitating human psyche).

Yoga Vāsiṣṭha, 1.30

आधिक्षये चाधिभवाःक्षीयन्ते व्यधयोऽप्यलम् ॥३३॥

अनाधिजा व्याधयस्तु द्रव्यमन्त्रशुभक्रमैः ।

चिकित्सकादिशास्त्रोक्तैः नश्यन्ति त्वं च वेत्सि तत् ॥३४॥

Ādhikṣaye cādhibhavāḥkṣīyante vyadhayo'pyalam ॥33॥

Anādhijā vyādhayastu dravyamantraśubhakrmāiḥ

Cikitsakādīśāstrottkaiḥ naśyanti tvam ca vetsyi tat ॥34॥

On the removal of mental sickness, even physical ailments born of mental sickness are surely destroyed. But the physical ailments not produced by mental sickness perish by auspicious methods of suitable materials and Mantras or sacred words and through the words of the science of healing.

Yoga Vāsiṣṭha, 1. 33,34

असमे वहति प्राणे नाड्यो यन्ति विसंस्थितिम् ।

कुजीर्णत्वं आजीर्णत्वं अतिजीर्णत्वमेव वा ॥३६॥

Asame vahati prāṇe nāḍyō yanti viśamsthitim

Kujīrṇatvam ājīrṇatvam atijīrṇatvameva vā ॥36॥

Uneven flows bio-energy channels leads to improper condition. Because of the perverseness of the bio energy current in their channels, the food (which is eaten) goes forth only towards harm by bad digestion, indigestion or even over digestion.

Yoga Vāsiṣṭha, 1.36

कुजीर्णत्वमजीर्णत्वमेव वा ।

दोषायैव प्रयात्यत्रं प्राणसंचारदुष्क्रमात् ॥१॥३५॥

Kujīrṇatvamañjīrṇatvameva vā

Doṣāyaiva prayātyatrāṅ prāṇasañcāraduṣkramāt ||1||35||

The want of free breathing is attended both with indigestion and bad digestion of the food, and also evaporation of the cycle and blood that it produces; and these defects in digestion, bring forth a great many maladies in the system.

Yoga Vāsiṣṭha, 1.35

यथा काष्ठानि नयति प्राचिदेशां सरिद्रयः ।

तथान्नानि नयत्यन्तः प्राणवातः स्वमाश्रयम् ॥१॥३६॥

Yathā kāṣṭhāni nayati prācidesāṅ saridrayaḥ

Tathānnāni nayatyantaḥ prāṇavātaḥ svamāśrayam ||1||36||

The five *prāṇas* carry the essence of the food ingested to the internal organs, as currents in a river carry floating sticks and logs downstream.

Yoga Vāsiṣṭha, 1.36

यान्यन्नानि निरोधेन तिष्ठन्त्यन्तः शारीरके ।

तान्येव व्याधितां यान्ति परिणामस्वभावतः ॥१॥३७॥

Yānyannāni nirodhena tiṣṭhantyaṅtāḥ śārīrake

Tānyeva vyādhitāṅ yānti pariṇāmasvabhāvataḥ ||1||37||

Undigested matter remaining in the intestine, having failed to be assimilated into the bloodstream, and circulated in the system because of imbalance in the *prāṇa* due to nadi blockages; ends up being the source of any number of diseases.

Yoga Vāsiṣṭha, 1.37

एवमाधेभवेद्वाधिस्तस्याभावाच्च नश्यति ।

यथा मन्त्रैर्विनश्यन्ति व्याधयस्तत्क्रमं शृणु ॥१॥३८॥

Evamādherbhavedyavādhistasyābhāvācca naśyati|

Yathā mantrairvinaśayanti vyādhayastatkramam śrṇu||1||38||

Thus it is that the perturbed states of the mind and spirit, produce the disease of the body, and are avoided and removed by want of mental anxiety.

Yoga Vāsiṣṭha, 1.38

सत्वशुद्ध्या वहन्त्येते क्रमेण प्राणवायवः ॥४०॥

जरयन्ति तथाऽन्नानि व्याधिः तेन विनाशयति ।

Satvaśuddhacyā vahantyeṭe krameṇa prāṇavāyavaḥ||40||

Jarayanti tathā'nnāni vyādhiḥ tena vināśayati|

By the purity of the mind these vital airs flow in regular course; so also, the food are digested because of that, Physical ailments perishes.

Yoga Vāsiṣṭha, 1.40

PRĀṆA ACCORDING TO VIVEKACŪDĀMAṆI

प्राणापानव्यानोदानसमाना भवत्यसौ प्राणः ।

स्वयमेव वृत्तिभेदाद्विकृतिभेदात्सुवर्णसलिलादिवत् ॥ ९५ ॥

Prāṇāpānavyānodānasamānā bhavatyasau prāṇaḥ ।

Svayameva vṛttibhedādvikṛtibhedātsuvarṇasalilādivat ॥ 95 ॥

The same *Prāṇa* becomes *Prāṇa*, *Apana*, *Vyana*, *Udana* and *Samana* according to their diversity of functions and modifications, like gold and water etc.

Vivekacūḍāmaṇi, 95

वागादि पञ्च श्रवणादि पञ्च

प्राणादि पञ्चाभ्रमुखानि पञ्च ।

बुद्ध्याद्यविद्यापि च कामकर्मणी

पुर्यष्टकं सूक्ष्मशरीरमाहुः ॥ ९६ ॥

Vāgādi pañca śravaṇādi pañca

Prāṇādi pañcābhramukhāni pañca ।

Buddhyādyavidyāpi ca kāmakarmanī

Puryaṣṭakam sūkṣmaśarīramāhuḥ ॥ 96 ॥

The five organs of action such as speech etc., the five organs of knowledge beginning with the ear, the group of five *Prāṇa*, *Buddhi* and the rest, together with Nescience, desire and action these eight ‘cites’ make up what is called subtler body.

Vivekacūḍāmaṇi, 96

उच्छ्वासनिःश्वासविजृम्भणक्षुत्

प्रस्यन्दनाद्युत्क्रमणादिकाः क्रियाः ।

प्राणादिकर्माणि वदन्ति तज्ञाः

प्राणस्य धर्मावशनापिपासे ॥ १०२ ॥

Ucchvāsaniḥśvāsavijṛmbhaṇakṣut

Prasyandanādyutkramaṇādikāḥ kriyāḥ ।

Prāṇādikarmāṇi vadanti tajñāḥ

Prāṇasya dharmāvaśanāpipāse ॥ 102॥

Inhalation and exhalation, yawning, sneezing, secretion, and leaving this body etc. are called by experts functions of *Prāṇa* and the rest, while hunger and thirst are characteristics of *Prāṇa* proper.

Vivekacūḍāmaṇi, 102

अस्ति कश्चित्स्वयं नित्यमहंप्रत्ययलम्बनः ।

अवस्थात्रयसाक्षी सन्पञ्चकोशविलक्षणः ॥ १२५ ॥

Asti kaścitsvayaṁ nityamahampratyayalambanaḥ ।

Avasthātrayasākṣī sanpañcakōśavilakṣaṇaḥ ॥ 125॥

There is some Absolute Entity, the eternal substratum of the perception of Egoism, the witness of three states, a distinct from the five sheaths or coverings. (Five sheaths Consisting respectively of *Anna* (matter), *Prāṇa* (force), *Mana* (mind), *Vijnina* (knowledge) and *Ananda* (Bliss). The first two comprise this body of ours, the third and

fourth make up the subtle body (*Sukshma Sarira*) and the last the causal body (*Karana Sarira*). The *Atman* referred to in this *Sloka* is beyond them all.

Vivekacūḍāmaṇi, 125

ज्ञाता मनोऽहंकृतिविक्रियाणां

देहेन्द्रियप्राणकृतक्रियाणाम् ।

अयोऽग्निवत्ताननुवर्तमानो

न चेष्टते नो विकरोति किञ्चन ॥ १३३ ॥

Jñātā mano'haṅkṛtīvikriyāṇāṃ

Dehendriyaprāṇakṛtakriyāṇām ।

Ayo'gnivattānanuvartamāno

Na ceṣṭate no vikaroti kiñcana ॥ 133॥

The knower of the modifications of mind and egoism, and of the activities of the body, the organs, and *Prāṇas*, apparently taking their forms, like the fire in a ball of iron; it neither acts nor is subject to change in the least.

Vivekacūḍāmaṇi, 133

कर्मेन्द्रियैः पञ्चभिरञ्चितोऽयं प्राणो भवेत्प्राणमयस्तु कोशः ॥

येनात्मवानन्नमयोऽनुपूर्णः प्रवर्ततेऽसौ सकलक्रियासु ॥ १६५ ॥

Karmendriyaiḥ pañcabhirañcīto'yaṃ prāṇo bhavetprāṇamayastu kośaḥ ॥

Yenātmavānannamayo'nupūrṇaḥ pravartate'sau sakalakriyāsu ॥ 165॥

The *Prāṇa*, with which we are all familiar, coupled with the five organs of action, forms the Vital Sheath, permeated by which the Material Sheath itself in all activities as if it were living.

Vivekacūḍāmaṇi, 165

योऽयं विज्ञानमयः प्राणेषु हृदि स्फुरत्ययं ज्योतिः ।

कूटस्थः सन्नात्मा कर्ता भोक्ता भवत्युपाधिस्थः ॥ १८९ ॥

Yo'yaṁ vijñānamayaḥ prāṇeṣu hṛdi sphuratyayaṁ jyotiḥ ।

Kūṭasthaḥ sannātmā kartā bhoktā bhavatyupādhisthaḥ ॥ 189 ॥

The self-effulgent *Atman* which is Pure Knowledge shines in the midst of the *Prāṇas*, within the heart. Though immutable it becomes the agent and experience owing to its superimposition the Knowledge Sheath.

Vivekacūḍāmaṇi, 189

देहप्राणेन्द्रियमनोबुद्ध्यादिभिरुपाधिभिः ।

यैर्यैर्वृत्तेःसमायोगस्तत्तद्भावोऽस्य योगिनः ॥ ३७० ॥

Dehaprāṇendriyamanobuddhyādibhirupādhibhiḥ ।

Yairyairvṛtteḥsamāyogastattadbhāvo'sya yoginaḥ ॥ 370 ॥

The body, *Prāṇas*, organs, *Manas*, *Buddhi* and the rest, with whatsoever of these Upadhis the mind is associated, the *Yogin* is transformed, & it were, into that.

Vivekacūḍāmaṇi, 370

देहेन्द्रियप्राणमनोऽहमादिभिः स्वाज्ञानक्लृप्तैरखिलैरुपाधिभिः ।

विमुक्तात्मानमखण्डरूपं पूर्णं महाकाशमिवावलोकयेत् ॥ ३८४ ॥

Dehendriyaprāṇamano'hamādibhiḥ svājñānakḷṛptairakhilairupādhibhiḥ ।

Vimuktamātmānamakhaṇḍarūpaṁ pūrṇaṁ mahākāśamivāvalokayet ॥ 384॥

One should behold the *Atman*, the Indivisible and Infinite, free from all *Upadhis* (supervening conditions) of the body, organs, *Prāṇas*, *Manas* and egoism etc. which are creations of one's own ignorance, like the infinite sky.

Vivekacūḍāmaṇi, 384

PRĀṆA ACCORDING TO ŚIVA SŪTRA

प्राणासमाचरे समदर्शनम्

Prāṇāsamācare samadarśanam

Prāṇa the vital force which controls and regulates the activities of a vehicle of consciousness on *समाचरे* on proper regulation and direction of *Prāṇa* referred to as *Prāṇayama समदर्शनम्* The attainment of the *turiya* state of consciousness which integrates all the three lower states of consciousness into the unified state of Atmic consciousness.

Śiva sūtra, 3. 22

नैसर्गिकः प्राणसंबन्धः

Naisargikah prāṇasambandhaḥ

The principle of *Prāṇa*, though it connects the pure Consciousness of *Purusa* with his vehicles in the realm of manifestation, belongs really to the realm of *Prakṛti* and so when

the consciousness of the *Purusa* reverts to the world of Reality as pointed out in the last aphorism, the *Prāṇa* remains behind with the vehicle and its association with *Purusa* is dissolved completely.

Śiva sūtra, 3. 43

PRĀṆA ACCORDING YOGA CHUDAMANI UPANISHAD

आक्षिप्तो भुजदण्डेन तथा यथोच्चलति क्स्न्दुकः ।

प्राणापानसमाक्षिप्तस्तथा जीवो न तिष्ठति ॥

Ākṣipto bhujadaṇḍena tathā yathoccalati ksndukaḥ |

Prāṇāpānasamākṣiptastathā jīvo na tiṣṭhati ||

Just as a ball goes up and down when thrown by the hand, similarly, the individual soul is thrown up (and down) by the movement of *Prāṇa* and *apāna* (and therefore) does not remain still.

Yoga Chudamani Upanishad, 5.27

PRĀṆA ACCORDING TO CHANDOGYA UPANIṢAD

यो ह वै ज्येष्ठं च श्रेष्ठं च वेद ज्येष्ठश्च ह वै श्रेष्ठश्च भवति प्राणो वाव ज्येष्ठश्च श्रेष्ठश्च ५ १ १

Yo ha vai jyeṣṭam ca śreṣṭam ca veda jyeṣṭaśca ha vai śreṣṭaśca bhavati prāṇo vāva

jyeṣṭaśca śreṣṭaśca V.I. I

Om, verily he who knows the eldest and best, surely becomes the eldest and the best.

Prāṇa is indeed the eldest and the best (of the organs)

Chandogya Upaniṣad, 5.1.1

प्राणो वाव आशया भूयन्यथा वरा नभौ समर्पिता एवमस्मिन् प्राणे सर्वं समर्पितं प्राणः

प्राणेन याति प्राणःप्राणं ददाति प्राणाय ददाति प्राणो ह पिता प्राणो माता प्राणो भ्राता प्राण : स्वसा प्राण

आचार्यः प्राणो ब्राह्मणः ७ १५ १

Prāṇo vāva āśayā bhūyanyathā varā nabhau samarpitā evamasmin prāṇe sarvaṁ

Samarpitam prāṇaḥ prāṇena yati prāṇaḥ prāṇam dadāti prāṇāya dadāti prāṇe ha pitā

Prāṇe mātā prāṇo bhrātā prāṇa ḥ svasā prāṇā ācāryaḥ prāṇo brāhmaṇaḥ 7 :15: 1

Prāṇa surely is greater than aspiration. Just as the spokes of the wheel are fastend to the nave, so is all this fastened to this *Prāṇa*. *Prāṇa* moves by *Prāṇa*, *Prāṇa* give *Prāṇa* and it gives *Prāṇa*.

Prāṇa is father, *Prāṇa* is the mothe, *Prāṇa* is the brother, *Prāṇa* is the sister, *Prāṇa* is the preceptor, *Prāṇa* is the Brahman.

Chandogya Upaniṣad 7.15.1

PRĀṆA ACCORDING TO ŚĀṆḌILYA UPANIṢAD

शरीरात्प्राणो द्वादशाङ्गुलाधिको भवति ।

शरीरस्थं प्राणमग्निना सह योगाभ्यासेन समं न्यूनं वा

यः करोति स योगिपुङ्गवो भवति । देहमध्ये शिखिस्थानं

त्रिकोणं तप्तजाम्बूनदप्रभं मनुष्याणाम् ।

Śarīrātprāṇo dvādaśāṅgulādhiko bhavati ।

Śarīrasthaṁ prāṇamagninā saha yogābhyāsena samaṁ nyūnaṁ vā

Yaḥ karoti sa yogipuṅgavo bhavati । dehamadhye śikhisthānaṁ

Trikonaṁ taptajāmbūnadaprabhaṁ manuṣyāṇām

The body is ninety-six in digits in length. *Prāṇa* extends twelve digits beyond the body. He who through the practice of yoga reduces his *Prāṇa* within his body to make it equal to or not less than the fire in it becomes the greatest of the *yogins*. In a men, the region of the fire which is triangular in form and brilliant as the molten gold is situated in the middle of the body.

Śāṅḍilya Upaniṣad, 1.15

FIVE KOSHAS FROM ŚARVASARA ŪPANIŚAD

अन्नमयप्राणमयमनोमयविज्ञानमयानन्दमयकोशाः कथम् ।

Annamayaprāṇamayamanomayavijñānamayānandamayakośāḥ katham ।

Annamaya sheath is the aggregate of the material formed by food. When the ten *vāyus* (Vital airs) *Prāṇas* and others, flow through the *annamaya* sheath, then it is called the *Prāṇamaya* sheath. When *m* connected with above two sheaths performs the functions of hearing, etc, through the 14 organs of *Manas* and others, then it is called *Manomaya* sheath.

When in the (*Anthakarana*) internal organs connected with above three sheaths, there arise the modifications of contemplation, meditation, etc., about the peculiarities of the sheaths, then it is called *Vijanamaya* sheath. When the self cause *J na* is in its self bliss like the banyan tree in its seed, though associated with *añ na*, then it is called *annandamaya* sheath. *Ātmā* which is associated with the *upādhi* (vehicle) of these sheaths is figuratively called *kosha*.

Śarvasara Ūpaniṣad, 1.6

PRĀṆA ACCORDING TO MUKTIKOPANIŚAD

वासनावशतः प्राणस्पन्दस्तेन च वासना ।

क्रियते चित्तबीजस्य तेन बीजाङ्कुरक्रमः ॥ २६ ॥

Vāsanāvaśataḥ prāṇaspandastena ca vāsanā ।

Kriyate cittabījasya tena bījāṅkurakramaḥ ॥ 26॥

The sages know that *vāśana* comprises all objects generated by creative faculty of the mind in attending or avoiding them. The very unsteady mind which is the cause of birth, old age and death is generated by desire for objects in excess.

Muktikopaniśad, 2.2.26

द्वे बीजे चित्तवृक्षस्य प्राणस्पन्दनवासने ।

एकस्मिंश्च तयोः क्षीणे क्षिप्रं द्वे अपि नश्यतः ॥ २७ ॥

Dve bīje cittavṛkṣasya prāṇaspandanavāsane ।

Ekasmiṁśca tayoh kṣīṇe kṣipraṁ dve api naśyataḥ ॥ 27॥

By the influence of *Vāśana* there is the pulsation of *Prāṇa*, from it comes *Vāśana* (Again) like seed and sprout. For the tree of the human mind, the pulsation and *vāśana* are two seeds- when one dies both die. Latent impressions stop operating through detached behaviour, avoidance of worldly thought and realization that the body is mortal.

The mind becomes non-mind by giving up *Vāśanas*. When the mind does not think, then arises mindlessness giving great peace; so long as your mind has not fully evolved, being ignorant of the supreme reality, perform what has been laid down by the teacher, *śāstras*

and other sources. Then impurity ripened (and destroyed) and truth understood, you should give up even the good impressions.

Muktikopaniṣad, 2.2.27

PRĀṆA ACCORDING TO BṚHADĀRANYAKA UPANIṢAD

त्रयो लोका एत एव; वगेवायं लोकः, मनोऽन्तरिक्षलोकः प्राणोऽसौ लोकः ॥

Trayo lokā eta eva; vagevāyaṁ lokaḥ, mano'ntarikṣalokaḥ prāṇo'sau lokaḥ ॥

These are the three worlds. The organ of speech is this world(the earth), the mind is the sky, and the vital force is that world (heaven)

Bṛhadāranyaka Upaniṣad, 1.5.3.4

त्रयो वेदा एत एव; वगोवर्ग्वेदः मनो यजुर्वेदः, प्राणाः सामवेदः ॥

Trayo vedā eta eva; vagovargvedaḥ mano yajurvedaḥ, prāṇāḥ sāmavedaḥ ॥

These are the three *vedas*.

The organ of speech is th *Re-Veda*. The mind is the *Yajurveda* and the vital force the *Sāma-Veda*.

Bṛhadāranyaka Upaniṣad, 1.5.3.5

पिता माता प्रजैत एव; मन एव पिता, वाङ् मता, प्रणाः प्रजा ॥

Pitā mātā prajaita eva; mana eva pitā, vāiṅ matā, praṇāḥ prajā ॥

These are the father, mother and child. The mind is the father, the organ of speech the mother, and the vital force the child.

Bṛhadāranyaka Upaniṣad, 1.5.3.7

यत्किञ्चाविज्ञातं प्राणस्य तद्रूपम्, प्राणो ह्यविज्ञातः; प्राण एनं तद्भूत्वावति ॥

Yatkiñcāvijñātaṁ prāṇasya tadrūpam, prāṇo hyavijñātaḥ; prāṇa enaṁ tadbhūtoāvati ॥
Whatever is unknown is a form of the vital force, for the vital force is what is known. The vital force protects him (who knows this) by becoming that (which is unknown)

Bṛhadāraṇyaka Upaniṣad, 1.5.3.10

प्राणो वै ग्रहः, सोऽपानेनातिग्रहेण गृहतिः, अपानेन हि गान्धञ्जिग्रति ॥

Prāṇo vai grahaḥ, so'pānenātiagraheṇa gṛhatih, apānena hi gāndhañjighrati ॥
The *prāṇa*(nose) indeed is the *Graha*: it is controlled by the *Atigraha*, the *Apāna* odour), for one smells odours through the *Apāna* (The air breathed in)

Bṛhadāraṇyaka Upaniṣad, 3.2.4.2

यः प्राणे तिष्ठन् प्राणादन्तरो यंप्राणो न वेद यस्य प्राणाः शरीरं ।

यः प्राणमन्तरो यमत्येष त आत्मान्तर्यम्यमृतः ॥

Yaḥ prāṇe tiṣṭan prāṇādantaro yaṁprāṇo na veda yasya prāṇāḥ śarīraṁ ।

Yaḥ prāṇamantaro yamatyeṣa ta ātmāntaryamyamṛtaḥ ॥

The intelligent soul is placed in *Prāṇa*, inside the *Prāṇa*, it pervades the *Prāṇa*, yet the non-intelligent are unaware of it. *Prāṇa* itself has become the body of the chief master, who controls it from the inside. Thus the soul is immutable, indestructible and immortal.

Bṛhadāraṇyaka Upaniṣad, 3.7.16

PRĀṆA ACCORDING TO ŚARIRAKA ŪPANIŚAD

बुद्धिकर्मेन्द्रियप्राणपञ्चकैर्मनसा धिया ।

शरीरं सप्तदशाभिः सूक्ष्मं तल्लिङ्गमुच्यते ॥ ५ ।

Buddhikarmendriyaprāṇapañcakairmanasā dhiyā ।

Śarīraṁ saptadaśābhiḥ sūkṣmaṁ talliṅgamucyate ॥ 5।

The organs of sense (five) the organ of action (five), *manas* and *buddhi*-all these seventeen are said to constitute the *sūkṣma* of *liṅga* (subtle) body.

Śariraka Ūpaniśad, 1.5

PRĀṆA ACCORDING TO CHANDOGYA UPANISHAD

सर्वाणि ह वा इमानि भूतानि ।

प्राणमेवाभिसंविशन्ति प्राणमभ्युज्जहते ॥१-११-५

Sarvaṇi ha vā imāni bhūtāni।

Prāṇamevābhisamviśanti prāṇamabhyujjahate ॥1-11-5

In *Prāṇa* all moveable and immoveable beings merge (during dissolution) and rise out of *Prāṇa* (during creation).

Chandogya Upanishad, 1.11.5

PRĀṆA ACCORDING TO KATHOPANISHAD

यदिदं किं च जगत्सर्वं प्राण एजति निःसृतम् ।

Yadidaṁ kiṁ ca jagatsarvaṁ prāṇa ejati niḥsṛtam।

This whole world - whatever there is - vibrates having originated from *Prāṇa*. This cosmic *Prāṇa*, also called *mahaprāṇa*, came into being at the time of creation. Thus, in order to fully understand *Prāṇa*, one must go back to the beginning of creation.

Kathopanishad, 2.3.2

PRĀṆA ACCORDING TO SHIVA SWARODAYA

In the *Shiva Swarodaya*, Devi asks Shiva: "In this universe who is the greatest friend of man?"

Shiva replies (v. 219):

प्राण एव परं मित्रं प्राण एव परः सखा ।

प्राणातुल्यः परो बन्धुर्नस्ति नास्ति वरानने ॥

Prāṇa eva param mitram prāṇa eva paraḥ sakhā

Prāṇātulyaḥ paro bandhurnasti nāsti varānane ॥

Prāṇa is the greatest friend, *Prāṇa* is the greatest companion. O fair one, there is no closer friend in this universe than *Prāṇa*.

Shiva Swarodaya, 5.219

CONCEPT OF VĀYU ACCORDING TO CARAKA SAMHITA

FIVE DEVISION OF VAYU

प्राणोदानसमानाख्यव्यानापानैश्च पञ्चधा ।

देहं तन्त्रयते सम्यक स्थानेष्वव्याहतश्चरन् ॥५

Prāṇodānasamānākhyavyānāpānaiśca pañcadhā |

Dehaṁ tantrayate samyak sthāneṣvavyāhataścharan ॥5

With its five fold division, viz, *prāṇa*, *udāna*, *samāna*, *vyāna* and *apāna*, *vāyu* appropriately control (sustains) the (functions of the) body by its unimpaired movements in the locations concerned.

Caraka Samhita Cikitsāsthāna, 28.5. 5

LOCATION AND FUNCTION OF PRĀṆA VAYU

स्थानं प्राणस्य मूर्धरः कण्ठजिह्वास्यनासिकाः ।

ष्टीवनक्षवथूद्गारश्चासाहारादि कर्म च ॥ ६ ॥

Sthānaṁ prāṇasya mūrdharāḥ kaṇṭhajihvāsyanāsikāḥ |

Ṣṭīvanakṣavathūdagāraśvāsāhārādi karma ca ॥ 6 ॥

prāṇa -vāyu is located in the head, chest, throt, tounge, mouth and nose. Its functions are spitting, sneezing, eructation, respiration, deglutition of food, etc. The term *āhārā* implies deglutition, retension etc., of the ingested food.

Caraka Samhita Cikitsāsthāna, 28.5. 6

LOCATION AND FUNCTION OF APANA VAYU

वृषणौ वस्तिमेढ्रं च नाभ्यूरु वंक्षणौ गुदम् ।

अपानस्थानमन्त्रस्थः शुक्रमूत्रशकृन्ति च ॥१० ॥

सृजत्यार्तवगर्भौ च युक्ताः स्थानस्थिताश्च ते ।

स्वकर्म कुर्वते देहो धार्यते तैरनामयः ॥ ११ ॥

Vṛṣaṇau vastimedhram ca nābhyūrū vaṅkṣaṇau gudam |

Apānasthānamantrasthaḥ śukramūtraśakṛnti ca || 10 ||

Sṛjatyārtavagarbhau ca yuktāḥ sthānasthitāśca te |

Svakarma kurvate deho dhāryate tairanāmayaḥ || 11 ||

apāna – vāyu is located in the two testicles, urinary bladder, phallus, umbilicus, thighs, groins, anus and and colon. Its functions are the ejaculation of semen, voiding of urine and stool, elimination of menstrual blood and parturition of foetus.

These five types of *vāyu*, located in their respective abodes in normal state, perform their functions properly in order to sustain the physique in a health state.

Caraka Saṁhita Cikitsāsthāna, 28.5. 10

LOCATION AND FUNCTION OF SAMANA VAYU

स्वेददोषाम्बुवाहीनि स्रोतांसि समाधिष्ठितः ।

अन्तरगनेश्च पार्श्वस्थः समनोऽग्निबलप्रदः ॥८ ॥

Udānasya punaḥ sthānaṁ nābhyuraḥ kaṅṭha eva ca |

Vākpravṛttiḥ prayatnaurjobalavarṇādi karma ca || 7 ||

Svedadoṣāmbuvāhīni strotāṁsi samādhiṣṭhitāḥ

Antaraganeśca pārśvastha samano'ginabalapradāḥ ||8||

Samana vāyu pervading the *sveda-vāha-* srotas (channels carrying sweat), *dosha- vāha -* srotas (channels carrying *doṣās*) and *ambu- vāha -*srotas (channels carrying aqueous material) is located in the neighbourhood of *antaragni* or *jatharagni* (seat of digestive enzymes). It promotes the power of digestion.

Caraka Saṁhita Cikitsāsthāna, 28.5. 8

LOCATION AND FUNCTION OF UDANA VAYU

उदानस्य पुनः स्थानं नाभ्युरः कण्ठ एव च ।

वाक्प्रवृत्तिः प्रयत्नौर्जोबलवर्णादि कर्म च ॥७॥

Udānasya punaḥ sthānaṁ nābhyuraḥ kaṇṭha eva ca

Vākpravṛttiḥ prayatnaurjobalavarṇādi karma ca ||7||

Udāna – vāyu is located in the umbilicus, chest and throat. Its functions are manifestation of speech, effort, enthusiasm, strength and complexion.

Chest is described to be the location of both *prāṇa vāyu* and *udana vāyu*. As a *malakara* (maker of flower garlands) and a *kumbhakara* (pot maker) may stay in the same premises, but retain their own identities (functions), similarly both these *vāyus*, viz.. *prāṇa* and *udāna*, eventhough sharing the same location like chest, have their own identities because of their distinct and different functions.

Caraka Saṁhita Cikitsāsthāna, 28.5. 7

LOCATION AND FUNCTION OF VYANA VAYU

देहं व्याप्नोति सर्वं तु व्यानः शीघ्रगतिर्नृणाम् ।

गतिप्रसारणाक्षेपनिमेषादिक्रियः सदा ॥९॥

Dehaṁ vyapnoti sarvaṁ tu vyānāḥ śīghragatirnrṇām |

Gātiprasāraṇākṣepanimeṣādikriyaḥ sadā ||9||

The *vyāna- vāyu* moves very swiftly and pervades the entire physique of a person. It always functions in the form of motion, extension, *vikṣepa* (sudden movements), winking of the eyes and similar other movements (concentration, etc)

Caraka Saṁhita Cikitsāsthāna, 28.5.9






Table 2				
SUBTYPES OF VATA				
Subtypes	Governing Element	Primary Sites	Functions	Direction
<i>Prāṇa</i>	Ether	Head, Brain	Purana: to fill the space	
<i>Udāna</i>	Air	Diaphragm, throat	Udvahana: moves upward	
<i>Samāna</i>	Fire	Small intestine, navel	Viveka: isolation, separation, splitting	
<i>Apāna</i>	Earth	Colon, pelvic cavity	Sharana: holding	
<i>Vyāna</i>	Water	Heart, whole body	Praspandanam: pulsation, throbbing	

Table 2 Caption: Table 2 presents properties of the five Vata Subdoshas – aspects of the life-breath.

CONCEPT OF HEALTH AND DISEASE

कालार्थकर्मणां योगो हीनामिथ्यातिमात्रकः ।

सम्यग्योगश्च विजेयो रोजारोग्यैक कारणम्

Kālārthakaormaṇām yogo hīnamithyātimātrakaḥ।

Samyagyogaśca vijeyo rojārogyaika kāraṇam

Less, more or wrong unison of time, senses and functions is the reason for disease and the right unison of these three factors is the reason for health.

Astanga Hridaya Sutrasthan, 8

रोगस्तु दोषवैषम्यं दोष साम्यं अरोगता ।

Rogastu doṣavaīṣamyam doṣa sāmiam arogatā।

Imbalance in *Tridosha* is disease. Perfect balance is health.

Astanga Hridaya Sutrasthan, 1.20

ओजस्तु तेजो धातूनां शुक्रान्तानां परं स्मृतम् ।

हृदयस्दृथमपि व्यापि देहस्थितिनिबन्धनम् ॥३७॥

स्निग्धं सोमात्मकं शुद्धमीपल्लोहितपीतकम् ।

यन्नाशे पियतं नाशो यस्मिस्तिष्ठति तिष्ठति ॥३८॥

निष्पधन्ते यतो भावा विधिधा देहसंश्रयाः ।

Ojastu tejo dhātūnām śukrāntānām param smṛtam।

Hridayasdṛthamapi vyāpi dehasthitinibandhanam॥37॥

Snigdham somātmakam śuddhamīpallōhitapītakam।

Yannāśe piyataṁ nāśoo yasmistiṣṭhati tiṣṭhati॥38॥

Niṣpadhante yato bhāvā vidhidhā dehasamśrayāḥ।

Ojas and *tejas* the *sara* (essence) of the *dhatu*s ending with *sukra* (reproductive tissue); though located in the *hrdaya* (heart), it pervades all over the body and controls the working of the body; it is (preponderant in a *bhuta* or watery principle), clear (transparent) , slight reddish yellow in color; by its loss the loss of body (even of life) is sure to happen and by its presence the body and life are sure to survive; from it are brought about the different state (conditions activities etc.) concerned with related to residing in) the body.

Astanga Hridaya Sutrasthan, 11.37, 38

शरीरं सत्त्वसंज्ञं च व्याधीनामाश्चयो मतः ।

तथा सुखानं योगस्तु सुखानां कारणं समः ॥५५॥

Śarīraṁ sattvasañjhaṁ ca vyādhīnāmāścayo mataḥ।

Tathā sukhānaṁ yogastu sukhānāṁ kāraṇaṁ samaḥ ॥55॥

The body and mind constitute the substrata of disease and happiness (positive health). Balanced utilization (of time, mental faculties and object of sense organs) is the cause of happiness.

Charaka Samhitha Sūtrastāna, 1.55

DEFINITION OF MADHUMEHA

मधुरं यच्च मेहेषु प्रायो मध्विव मेहति ।

सर्वऽपि मधुमेहाख्या माधुर्याच्च तनोरतः ॥२६ ॥

Madhuraṁ yacca meheṣu prāyo madhviva mehati

Sarva'pi madhumehākhyā mādhuryācca tanorataḥ ॥26॥

All type of *prameha* where the patient passess honey like urine and the entire body becomes very sweet, are known as *Madhumeha*.

Astanga Hriday, 3.10.21

DAIABETES MELLITUS

मधुमेहे मधुसमं जयते स किल द्विधा ।

कुध्द् धातुक्षयाद्वायै दोषावृतपथेऽथवा ॥२४ ॥

आवृतो दोषलिङ्गानि सोऽनिमित्तं प्रदर्शयन् ।

क्षणातक्षीणः क्षणात् पूर्णि भजते कृच्छसाध्यताम् ॥

Madhumehe madhusamaṁ jayate sa kila dvidhā

Kudhd dhātukṣayādvāyāi doṣāvṛtapathe'thavā ॥14

Āvrto doṣaligaṇi so'nimittaṁ pradarśayan

Kṣaṇātakṣīṇaḥ kṣaṇat pūrṇi bhajate kṛcchasādhyatām ॥

In *madhumeha* the urine becomes like huney. It is of two distinct types, one due to the aggravation of *vayu* on account of the depletion of tissues and the other due to the channels being blocked by *doshas*, Whne there is blockage of the channels, there are the

additional symptoms of vitiation of the particular *dosha* without any other apparent cause.

Astanga Hridaya, 3.10.18

FOUR TYPE OF VATA PRAMEHĀḤ

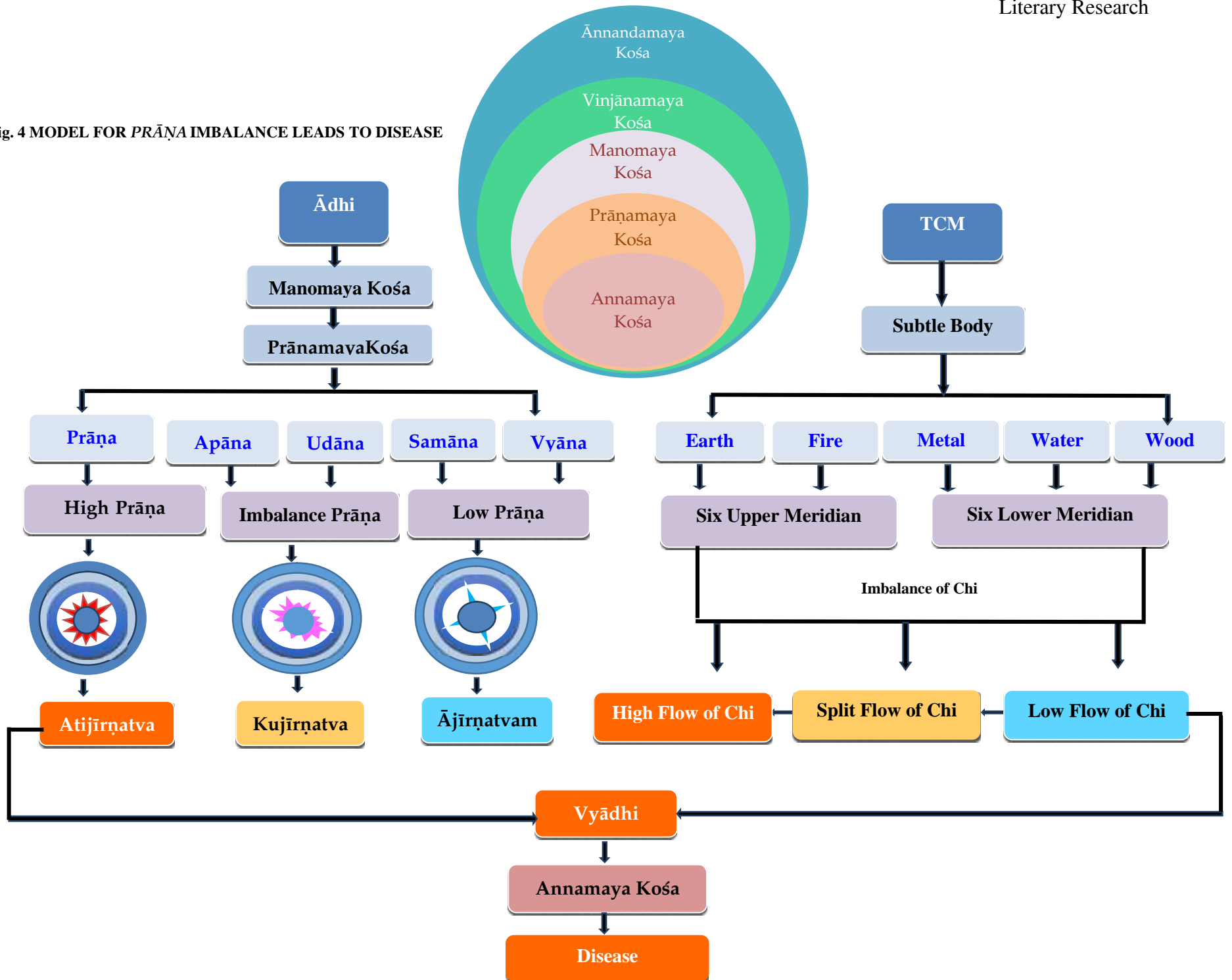
वसामेहश्च मज्जामेहश्च हस्तिमेहश्च मधुमेहश्चेति चत्वारो वातनिमित्ताः प्रमेहा :

*Vasāmehaśca majjāmehaśca hastimehaśca madhumehaśceti catvaro vātanimittāḥ
pramehāḥ*

Vasāmeha, majjāmeha, hastimeha and *madhumeha*- these four types are due to vata.

Caraka Samhita Sūtrastāna, 19.1. 3

Fig. 4 MODEL FOR PRĀṆA IMBALANCE LEADS TO DISEASE



In this model of disease susceptibility according to states of *Prāṇa*, balance and imbalance in levels of pranic energy in the subtle body (*Prāṇamayokosha*) are considered of key importance. Imbalances can lead to psychosomatic disease at the physical level, due to any of three kinds of inappropriate levels of *Prāṇa* in the body – *Atijirnatva*, *Kujirnatva*, and *Ajirnatvam*. Similar observations are made for Chi in Traditional Chinese Medicine (TCM): disease arises when levels of Qi are too high, too low, or its values on left and right sides of the body are ‘split’ i.e. too different. TCM and ISM are in apparent agreement over this.

The *Prāṇamaya kosha* is the second ‘sheath’, considered the sheath of the vital force, the first ‘subtle body’. Imbalance in the five *upaprāṇas* (*subprāṇas*) can also be expressed as high (*Atijirnatvam*), imbalance (*Kujirnatvam*) or low (*Ajirnatvam*). In TCM, Qi imbalance can manifest as imbalances in the five elements; imbalances disturbing the balance of chi flow in the six upper and/or six lower meridians, expressed as high, split, or low flow of Qi. Such imbalances can percolate into the physical body and manifest as physical disease (*Vyādhi*).

2.6 SUMMARY AND CONCLUSION

Prāṇa is life force energy, with functions connected to respiration and circulation. Without it, *ojas* could not circulate through the body, nor would *tejas* be kindled. It supports both *ojas* and *tejas*. These three, *ojas*, *tejas*, and *prāṇa* are connected. An imbalance in the other two causes imbalance in *prāṇa* and vice versa (Lad, 1995). Yoga as a way of life is a primary means of prevention of psychosomatic stress problems

causing physical, emotional and mental disorders. Yoga practice helps us regain our birthright of health and happiness. Only when we are healthy and happy can we fulfill our *dharma*. Adopting proper attitudes and lifestyle through a Yoga way of life enables one to rise above one's circumstances, so that life blossoms into a time of variety, creativity, and fulfillment. Following yoga life style helps us regain the ease lost through disease; this is the message of “*sthira sukham asanam*” *Yoga Sutra II.46* (Taimini, 2005), which also produces mental equanimity *Samatvam yoga Uchyate in Bhagavad Gita 2.48* (Abhedananda, 2005), where the opposites cease to cause problems *Tato Dwandwa Anabhighatha II.48* (Taimini, 2005). We can then move from states of illness and disease to states of health and well being, ultimately promoting the transition from life driven by lower animal nature to being in tune with our higher human nature; then to our real birthright, the highest Divine Nature.

Breath and *prāṇa* affect mind and emotions, and also our beliefs and karma. Just as our judgments, beliefs, and karma affect our mind and emotions, our *prāṇa* and breathe influence the physical body. For example *Madhumeha* can be correlated with Diabetes Mellitus in modern medicine. Ayurveda lists 20 subtypes of its precursor, *Prameha*, in terms of interactions between the *Doshas* and 10 *Dhatu Dushyas* (disturbances in the principles supporting the bodily tissues). Several result in sweet urine, others cause various colorations of the urine, indicating particular inflammatory conditions involved in metabolic syndrome, originating in *kapha* aggravation. *Apathyanimitaja Prameha* correlates with type 2 diabetes. *Madhumeha* is a subtype of *Vataja Prameha* occurring as the terminal stage of type 2 diabetes (Sharma & Chandola, 2011) Observing changes in subtle energies by Acugraph assessment may help early identification and prevention of

such health problems, and permit scientific definition of differences between them. In places where *prāṇa* becomes unevenly distributed, disease tends to manifest. Alternatively, if it accumulates too much somewhere, abnormal conditions can also arise. The desired condition is equal distribution of *prāṇa*, diffused in a balanced way throughout the body.

Being required in different proportions in different regions of the body, ideal *prāṇa* distribution does not mean that it must be present equally in all places. The correct balance, when present, is referred to as 'equal distribution of *prāṇa*'. Small diurnal variations occur. When food is eaten, there is increased concentration of *prāṇa* in the region of the stomach. When intellectual work is performed, *prāṇa* is more active in the brain. *Yogasanas* balance distribution of the *prāṇa* throughout the body in proportions required for normal function. Yogic interpretations are consistent with Ayurvedic theory of disease. They represent two angles of vision, two separate approaches. When the three *doshas* are aggravated, predominance of one in a particular place may draw *prāṇa* there in abnormal quantity, or may inhibit *prāṇa* from going there. *Ayurveda's* view is expressed in terms of *dosha* imbalance; the Yoga viewpoint is one of disharmony in *prāṇa* distribution. The two represent different perspectives on the same condition.

CHAPTER – 3

SCIENTIFIC LITERATURE REVIEW

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3. LITERATURE SURVEY OF SCIENTIFIC INVESTIGATIONS

3.1 EVIDENCE FOR ACUPUNCTURE POINTS AND MERIDIANS

TCM philosophy **NCD** of healing says that any illness is caused by either a blockage in the flow of Qi energy, the vital life-force, or an alteration of Qi flow. According to Eastern theories of healing any blockage or alteration of Qi flow is detectable in the meridian pathways. Measurements taken from meridian pathways in healthy and unhealthy persons should be different.

A substantial body of studies on the anatomy and physiology of acupuncture points exists (Voll, 1975) first demonstrated that there are numerous locations over the body that have lower electrical resistance and greater conductivity than their surroundings. When these points are mapped out, they correspond to the acupuncture points lying along the pathways described in TCM as the meridian system (Voll, 1978). Acupuncture points on meridian channels, and are thus believed to be distinguishable by their lower electrical resistance, although some claim that the evidence is still inconclusive (Yung, 2004). The Jing-well points constitute the endpoints of the 12 main meridian channels on each side of the body, and are located at corners of the nails on the fingers and toes. Acupuncture points on a meridian associated with an organ are said to become 'blocked' prior to the onset of illness connected to that organ, as well as in illness states (Voll, 1978). In the meridian system, any blockage or change in the flow of Qi energy leads to a deviation in the organism from normal health.

Electrodermal screening is the measurement of bio-impedance at acupuncture points (Voll, 1975), a measure that has since become common in TCM diagnosis. AcuGraph Digital

Meridian Imaging System, a computer software and hardware system developed by Meridia Technology, Inc. consists of software, an electronic control unit, and a probe set. The system electrically measures current flowing between specific acupoints on the hands and feet and a handheld reference probe. The software program allows data collection at either the 24 Yuan Source Points or the 24 Jing-well acupoints (also known as the Ryodoraku points). Typical usage consists of gathering patient identifying data, applying a water moistened cotton electrode probe to the acupoints to collect data, and interpreting data with charts, graphs, and recommendations produced by the software (Meridia Technologies Inc, 2008).

Even in the 1950s Voll had showed that the body has at least 1000 points on the skin following the lines of the classical Chinese meridians, which he called measurement points. Working with Fritz Werner, an engineer, Voll created an instrument to measure skin resistance at each of the acupuncture points, patterned after Galvanic Skin Resistance (GSR), which he named Point Testing. In 1953, he established the procedure known as Electro-Acupuncture according to Voll (EAV). This included two parts:

1. Point testing, measuring conductance at selected acupuncture points.
2. Establishing balance between conductances at different points by feedback, known as Medicine Testing (Sancier, 2003).

The AcuGraph system uses a measurement current of 0–40 μA to measure electrical conductance, which it then reports in normalized units on a scale of 0–200 established by (Nakatani, 1972) corresponding to a range of resistance values from 75 kohms to 2 Mohms.

3.2 ANATOMIC BASIS FOR MERIDIANS

In opposition to this, research in Korea claiming to have identified specific channels now named the bonghan circulatory system which has been identified with Acumeridian (Kwang-Sup, 2009).

Recent by neuro- physiologists have put forward the: a neural hypothesis” this suggesting that the clinical influence of acupuncture is transmitted primarily through stimulation of sensory nerve that provide information to the brain. This information when processed is what cause clinical changes associated with acupuncture treatment. This supporting the neural hypothesis aims that the peripheral and central nervous system can now be considered to be the best scientific experiment for “the meridians” (John & Longhurst, 2010).

The jing the main meridians which are the pathways linking the upper and lower body, the viscera (interior) and the skin, sinews, bones and other tissues (exterior). The Luo are the smaller collateral branches of the main meridians; which subdivide into smaller and smaller branches, forming a network of vessels reaching into every part of the body.

3.2.1 Meridian Physiology

Traditionally the Acumeridian are considered to be in two subdivisions Jing and Luo. The meridians, and collateral, form a pervasive network integrating the function of every part of the body into an organic whole. They provide the infrastructure that makes possible the circulation of Qi and blood, the actions of Yin–Yang.

3.2.2 Pathology

Energies in the meridians have a close relationship to the onset and development of disease. If a meridian-Qi is disturbed, the ability of that meridian to transport Qi is impaired. Regulation of Yin–Yang is then impaired and vital activities of the bodies cannot be protected probably by normal regulatory mechanism. When that happens, exogenous disease can attack the body successfully and cause pathology. The pathology can then further invade the meridians and transmit the imbalance either from exterior to interior or from interior to exterior. For example imbalance pathologies illnesses that arise in the visceral organs can extend into the exterior and the limbs through meridian pathways (Liu & Liu, 2009).

3.3 ACUPUNCTURE TREATMENT AND RESULT ON DIFFERENT DISEASES ON DM

Fifteen days of acupuncture treatment can relieve diabetic peripheral neuropathy (Tong, Guo, & Han, 2010). A review of 234 English publications listed on the PubMed database between 1979 and 2009 acknowledged the effectiveness of acupuncture as a treatment for IR. These publications provide limited clinical evidence, was found in support and the paper claimed that well-designed, RCT were needed to verify the effects various experimental studies have demonstrated acupuncture is efficacy for various metabolic disorders such as hyperglycemia, overweight, hyperphagia, hyperlipidemia, inflammation, altered activity of the sympathetic nervous system and insulin signal defect, all of which contribute to the development of IR. In addition, acupuncture has the potential to improve insulin sensitivity. Mechanisms have been proposed responsible for

the beneficial effect of acupuncture (Liang & Koya, 2010). It is effective in lowering FLP level, which may contribute to its clinical effect in improving type-II DM (Zhen & Jiu, 2011) Clinical and experimental studies have demonstrated that acupuncture has a beneficial effect on lowering serum glucose levels (Chen, Gong, & Zhai, 1994; Mao-liang, 1984). It seems that it can act on the pancreas to enhance insulin synthesis, increase the number of receptors on target cells, and accelerate the utilization of glucose, resulting in lowering of blood sugar. The therapeutic effects of acupuncture on diabetes do not seem to be the result of its action on the single organ but on multiple systems (Hu, 1995).

3.4 DIABETES MELLITUS AND RELATED ORGANS IN ACUPUNCTURE

DM is a disease which usually afflicts people who have passed middle age and more if they are obese. As acupuncture has a homeostatic action, needling any point tends to correct these diseases. Patients may be in some danger of a hypoglycaemic attack if they receive acupuncture for an unrelated condition, and continue to take usual doses of insulin or oral anti-diabetic preparations. Generally mild to moderate diabetics respond well to acupuncture therapy. Together with exercise and dietetic advice, the vast majority of patients could live free of medication or with lesser doses of drugs. Acupoints related to diabetes are Gall bladder 21; Spleen6, Liver 13, Liver 3, Stomach 36, Large Intestine 11, Large Intestine 18, and Sanjiao20. These are the pancreas points. Needling these points enhances the chi energy in this particular area. A needle at the pancreas point on the (left) ear is also effective in diabetic care (Tsuei & Chun, 1988). AI reported two major studies in diabetes mellitus (Tsuei & Lam, 1989) and one on hypertension (Tsuei & Wang, n.d.). The possibility of differentiating normal from abnormal functions of organ and systems was clearly shown by measuring bio-energy at a few specific points.

3.5 REVIEW OF ELECTRICAL MEASUREMENTS AT ACUPOINTS

Ahn and Martinsen (2007) discussed issues and challenges to electrical characterization of acupuncture points. He identified numerous factors that complicate electrodermal readings and present daunting challenges to studies of electrical characteristics ascribed to acupuncture points and meridians, He said that the idea that acupuncture points are associated with unique electrical measurements remains a contested issue and requires careful reassessment. Commercial electro-diagnostic devices are probably inadequate, and improved methods may be needed to pursue this line of research more rigorously.

3.6 RECENT SCIENTIFIC STUDIES USING ACUGRAPH

The first published S-VYASA study of the effects of Yoga practice on electrodermal conductances (Nagilla, Hankey, & Nagendra, 2013) found improvements in E_L values, (overall Qi energy levels) and U_L imbalances. Energy stability did not improve significantly. It concluded that the observed changes corresponded to improvements in system regulation, and therefore of health (Sharma, Hankey, Nagilla, Meenakshy, & Nagendra, 2014) extended this analysis to gender differences. She found that significant differences observed between genders prior to therapy, with readings for females lower than males, similar to those observed by Chamberlin et al, (Chamberlin, Colbert, & Larsen, 2011) were reduced to zero at the end of one month's Yoga training, with readings from both genders equal. Similarly, pre-post measurements on a five-day Stress Management for Executive Tension (SMET) program found significantly improved E-L energy levels (average increase 8.77 ± 2.72 points), with both sets of readings exceptionally low, indicating considerable professional strain in the workplace (Meenakshy, Hankey, &

Nagendra, 2014). In this study, post readings were easier to obtain, something commonly observed as conductance improves. An advantage of monitoring participants with AcuGraph emerged at the end of the course: E_L 'Qi Energy Levels' (i.e. *prāṇa*) in most participants were observed to still be far lower than desirable, indicating that modern executives require longer interventions, a judgment that could not have been made without AcuGraph (Meenakshy et al., 2014). Another study (Sharma, Hankey, Nagendra, & Meenakshy, 2014) observed large inter-operator variations in overall acupuncture meridian energy readings from a large group of T2DM patients essentially randomized between four operators. This suggested that in large studies conducted by many operators, inter-operator variability must be taken into account; otherwise variances will be artificially large, and actual values obtained may not have definite meaning. When interoperator differences were removed, the same pattern of variations in meridian energies was found by all four operators (Sharma, Hankey, Meenakshy, & Nagendra, 2014). This demonstrated that for Type 2 Diabetes Mellitus, characteristic patterns of meridian energy may be obtained from AcuGraph measurements on groups of patients.

A cross-sectional study of children with HIV (Meenakshy, Sharma, Hankey, & Nagendra, 2013) found reduced conductance values, i.e. depleted levels of *prāṇa*, in those with HIV infection compared to a control group matched for age and gender. It concluded that HIV infection strongly influences levels of *prāṇa*. These studies strongly suggest that electrodermal conductance at acupuncture points correspond to level of *prāṇa* and can validate the Yoga concept of health in terms of levels of *prāṇa*.

3.6.1 Acugraph- Validity, Reliability

AcuGraph3's advantages make it important that any limitations are well understood by those employing it. A 2009 study (Meenakshy, 2009a) conducted a rigorous experimental investigation of test-retest repeatability of electrodermal values at Jing-Well meridian endpoints, which were considered sufficient for preliminary testing. It concluded that variances in AcuGraph readings are too large for single readings to be considered medically accurate. A second study of AcuGraph's reliability (Mist et al., 2012) assessed test-retest repeatability in measurements on: (1) known resistors, (2) organic matter, (3) 30 subjects tested at both Jing-Well and Yuan-Source points by a single experienced operator, and (4) inter-operator variability for first-time, newly trained operators again on the same acupoints. It found CV's in the range of 17.7 to 34.8%, this agrees with our earlier conclusion (Meenakshy, 2009a) that AcuGraph variances in single readings may often be too high to make valid assessments on individual meridians.

Another study (Chamberlin et al., 2011) published norms for AcuGraph readings in the North American population, summarizing 43,088 measurements by 8,637 practitioners between 2005 and 2009. It assessed variations in values with time of day, gender and age, and finding important variations to be taken into account when comparing absolute values of measurements on different subjects.

The following studies focus on the effect of Yoga Therapy for DM patients (Bhaskaracharyulu, Sitaram, Kumari, Sahay, & Annapurna, 1986). *Hatha yoga* and conventional physical exercises (PT) may have useful preventative and protective therapeutic effects, by decreasing oxidative stress and improving antioxidant status (Gordon, McGrowder, Young, Fraser, Zamora, & Ruby, 2008). In another study, Yoga

asanas have shown beneficial effects on glycaemic control and nerve conduction in mild to moderate type 2 DM with subclinical neuropathy (Varun et al., 2002). Further studies indicate that a subtler yoga program could reduce risk of Type 2 DM, a good option for adults at high risk. In addition, yoga seems to be a promising approach to reducing cardio-metabolic risk factors, for which continuing practice increases self-efficacy (Yang et al., 2011). Studies suggest that yoga practice benefits the P300 response, and can thus be used as part of overall therapy for cognitive brain function impairment including the reverse cognitive impairment that occurs in diabetes (Kyizom, Singh, Singh, Tandon, & Kumar, 2010). Observational studies indicate that long-term asana practice increases the sensitivity of pancreatic *beta* cells to glucose signaling. This seems significant in that, for the first time, it posits a mechanism by which yoga asanas may help DM (Manjunatha, Vempati, Ghosh, & Bijlani, 2005).

Table 3: SUMMARY OF PUBLISHED RESEARCH AND THESES			
Citation	No of patients/Design	Summary	Results
AcuGraph Reliability			
Mist et.al., 2011	30 healthy volunteers, Independent Sample t test	AcuGraph provides repeatable readings on known resistors, non-human organic material and human acupoints recorded by a single operator.	Pressure sensor to the AcuGraph system and providing in-depth consensus training to the operators will lead to a level of interoperate variability that is acceptable for use in clinical trial.
AcuGraph, Influence of Age, Gender and Time of Day			
Chamberlin et.al., 2011	8637, Patients, two sample t tests, three way analyses of variance and Linear regression.	Skin conductance in general, is higher in males, in afternoons and declines with age.	Skin Conductance decline with age differs at different acupoints between males and females.
Effects of yoga practice on Acumeridian energies using AcuGraph			

Nagilla et.al.,2013	32 healthy individuals, pre-post design. Paired sample t test.	Significant improvements were observed in all but energy stability, supporting the ideas that yoga enlivens <i>prāṇa</i> (Chi), and that balance in meridians constitutes health.	Before and after measures of the three week yoga life-style intervention on 33 healthy young adults supported the overall Chi Energy for the group would be increased.
Yoga practices benefit health by improving organism regulation using AcuGraph			
Sharma et.al., 2014	33 volunteers of yoga instructor training, and 20 resident, experienced practitioners, Cross sectional design.	Yoga lifestyle practice can Increase and balance Acumeridian energies; long-term practice decreases group SD's.	Energy levels significantly improved in all 24 meridians (maximum p=0.032, 4-p<0.01, and 19-p<0.001). Females improved more than males (p<0.05)
Inter-operator Variability using AcuGraph			
Sharma, 2013	132 individuals, Operator1 (16 male,	Unless inter-operator variability is taken	Different operators can definitely

	<p>12 female), Operator 2 (18 male, 13 female), Operator 3 (15 male, 21 female), and Operator 4 (19 male, 18 female). Normality of distributions for each meridian and average variable was assessed using the Shapiro-Wilk test.</p>	<p>into account, actual values will not have any meaning.</p>	<p>obtain very different readings attributable to personal styles of use, such as the characteristic pressure exerted on the electrical probe.</p>
<p>Electrodermal characterization of type 2 diabetes with AcuGraph</p>			
<p>Sharma et.al.,2013</p>	<p>132 subjects, 2-Factor ANOVAS.</p>	<p>Upper meridians showed higher energy levels than lower.</p>	<p>The strongest meridian was Lungs; the weakest were Kidney and Bladder. Spleen and Gall Bladders were next weakest. Spleen weakness may be significant since the spleen meridian covers the pancreas.</p>
<p>Chi energy status in obesity patients assessment by AcuGraph</p>			

<p>Choudhary et.al.,2013</p>	<p>41 subjects, pre- post, paired sample t test.</p>	<p>Electro-dermal recordings showed to remedy the spleen functioning deficits, activating and energizing functions of lower organs as stomach, liver etc. and reducing over functioning of upper organs as lung, heart, pericardia etc.</p>	<p>IAYT is beneficial for obese patients within a short span of one week though long term studies might be essential to determine the benefits of IAYT in Chi Energy levels.</p>
<p>Effect of Acupressure walk using AcuGraph</p>			
<p>Mandal et.al.,2013</p>	<p>29 subjects, pre-post, paired sample t test.</p>	<p>After the Acupressure track walk energy level is come normally then the normal walk.</p>	<p>More change is showing Energy level after the Acupressure walk. Showing Energy level after the Normal walk, but not like Acupressure walk.</p>
<p>Assessment of SMET program for business executives</p>			

Meenakshy et.al.,2013	45 subjects, pre- post, paired sample t test.	5 days SMET intervention increased overall <i>prānic</i> energy in the main acupuncture meridian channels. The results begin to explain why yoga practice is clinically effective.	Energy levels were significantly improved compared to pre values after the SMET program for the subject (p<0.001). The results begin to explain why yoga practice is clinically effective.
Electrodermal Study Comparing HIV Infected Children with Non Infected Children			
Meenakshy et.al.,2013	43 HIV Children, Cross sectional design, Independent sample t test.	The study suggests that HIV infection depletes the level of chi, and that Yoga practice may be helpful in restoring it and increasing the sense of well-being.	Energy levels in HIV positive group were significantly lower in all meridians (p<0.001).
Electrodermal Study Comparing Depression and Healthy			
Meenakshy, et.al.,2013	27 Depression Patients, Cross sectional design, Independent sample t test.	SD's in AcuGraph measures of conductances at Jing-Well points are	Differences between means and F values were all highly significant,

		higher in patients with Depression compared to Healthy.	all $p < 0.0001$, except BL_L, $p < 0.0003$. Meridian properties of the two groups are completely distinct.
Effect of integrated yoga module (IYM) on energy level using AcuGraph			
Chaudhary, 2014	33 Subjects, pre- post, paired sample t test.	Yoga is a better tool to enhance the overall energy level specifically when an influenced regulation system is applied.	The Yoga group has shown significant improvement ($p < 0.05$) in 19 parameters in comparison to Control group where only 7 significant changes ($p < 0.05$).
Reliability study on Digestive Disorders compared to Acugraph			
Brain et.al., 2014	36 subjects, chi square test	Significant difference and percentage change in normal reading as recorded by AcuGraph in small intestine between asymptomatic and symptomatic group.	There were no significant changes seen in the stomach (ST) or Large intestine (LI) meridian.

Vedic yajña performance reduces Qi imbalances			
Meenakshy et.al.,2014	15 subjects, paired sample t-tests	<i>Yajña</i> performance has positive effects on human health. Further research should use subjects not previously exposed to yajñas, and also test observations that failed to attain significance in this study.	Lower meridians systematically improved, upper meridians did not. Initial Upper- Lower imbalances were reversed.

3.7 CONCLUSIONS

There are several advantages and disadvantages to be taken into account when considering using Acugraph measures in research. The advantages are that skin conductance is a comparatively robust physiological measure that can be measured relatively cheaply, easily, and unobtrusively. Electro-dermal screening has the capacity to identify the changes before and after the Yoga therapy interventions which benefits to the subtler level. The disadvantages are that measurement area is too large. The variability and consistence of the measurement are not able to fix.

CHAPTER – 4

AIM AND OBJECTIVES

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4.0 AIMS AND OBJECTIVES OF THE STUDY

4.1 AIMS

1. To establish baselines for Type 2 DM, Managers, HIV and Depression compared to respective normal healthy volunteers.
2. To examine the efficacy of IAYT on Type 2 DM and Managers using AcuGraph.

4.2 OBJECTIVES

1. To compare DM and Normal healthy subjects.
2. To compare Managers and Normal healthy subjects.
3. To compare HIV infected children and Non-infected children.
4. To compare Depression and Normal healthy subjects.
5. To examine whether changes in Acugraph readings in T2DM patients following IAYT indicate movement towards normalcy.
6. To examine whether changes in Acugraph readings following SMET suggest that the Managers are moving towards normalcy.

4.3 RESEARCH QUESTIONS

1. Are there differences in chi energy levels of diabetics, HIV infected children, managers, depression patients and normal healthy volunteers, as measured by AcuGraph recordings?
2. What changes do SMET and IAYT produce in AcuGraph meridian readings?

4.4 RESEARCH HYPOTHESES

1. There will be significant differences in AcuGraph chi energy measurements between normal and diabetic populations.
2. There will be significant differences in AcuGraph chi energy measurements between normal and Managers.
3. There will be significant differences in AcuGraph chi energy measurements between HIV infected and Non infected children.
4. There will be significant differences in AcuGraph chi energy measurements between normals and depression patients.
5. IAYT causes significant improvement in AcuGraph measures in Type 2DM leading them towards normal health.
6. SMET causes significant improvement in AcuGraph measures in executives leading them towards normal health.

4.5 NULL HYPOTHESES

1. There will be no observed differences in chi energy level between normal and diabetic populations as measured by AcuGraph.
2. There will be no significant differences in chi energy level between Normal's and Managers as measured by AcuGraph.

3. There will be no significant differences in chi energy level between HIV infected and Non infected children measured by AcuGraph.
4. There will be no significant differences in chi energy level between normal and Depression as measured by AcuGraph.
5. IAYT practice does not affect in any AcuGraph chi energy measurements in Type 2 DM.
6. SMET practice does not affect in any AcuGraph chi energy measurements in executives.

4.6 RELEVANCE AND BENEFITS OF THE STUDY

1. AcuGraph is an easy non-invasive test with qualitative measures of chi energy (*prāṇa*) level and imbalances at the *prāṇamayakosa* level.
2. Normative baseline characteristics of healthy volunteers, DM, depression, HIV, and Managers will be established.
3. AcuGraph provides a means to establish that yoga (IAYT) benefits health, in both disease states such as DM, and in professionals without overt pathology, and that such benefits are due to improvements in the *prāṇic* energy system e.g. the SMET program benefits executives by improving *prāṇic* energy levels.
4. AcuGraph also offers a uniform means to examine problems to health caused by specific pathologies e.g. T2DM, HIV infection, and Depression.

CHAPTER – 5

METHODS

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5.0 METHODS

5.1 SUBJECTS

5.1.1 Baseline comparison of Type 2 DM and Normal Healthy on Acugraph

Diabetes Group

Diabetes participants were from S-VYASA hospital *Ārogyadhāma*, in *Anekal Tāluka*, Bangalore, Karnataka.

Normal individuals

Healthy residents at SVYASA or participants registered for positive health promotion at S-VYASA hospital- *Ārogyadhāma*, in *Anekal Tāluka*, Bangalore, Karnataka (matched for age and gender with diabetes group)

One hundred and thirty patients attending the S-VYASA, *Arogyadhama*, Yoga Medicine Health Home, diagnosed to have Type 2 DM, of both gender (77 male, 53 female) aged 35-80 years, Mean Age \pm S.D, 58.52 ± 11.15 , compared with eighty-five 'healthy' adults of both gender (48 male, 37 female) attending the same institution for health improvement, also aged 35-80 years, Mean Age \pm S.D, 47.39 ± 10.48 .

5.1.2 Baseline comparison of Managers and Normal Healthy on Acugraph

Forty five Managers of both genders (39 male, 6 female), Mean Age \pm S.D, 52.14 ± 8.67 , and 55 normal healthy age range from 30-60 years (48 male, 7 female) participated in the study, Mean Age \pm S.D, 44.04 ± 8.62 .

5.1.3 Baseline comparison of HIV infected children and non-infected children on Acugraph

HIV Infected Group

Subjects were from the Belgaum rehabilitation home for HIV infected children.

Normal (non-infected) Group

Subjects were children attending Ten Day Personality Development Camps in Yoga University.

Forty-three HIV infected children of both genders (30 male, 13 female), Mean Age \pm S.D, 10.55 ± 2.97 , and 36 normal non-infected children age range 7-15 years (23 male, 13 female) participated in the study, Mean Age \pm S.D, 11.25 ± 2.36 .

5.1.4 Baseline comparison of Depression and Healthy subjects on Acugraph

Depression Group

Depression Patients were from S-VYASA hospital *Ārogyadhāma*, in *Anekal Tāluka*, Bangalore, Karnataka.

Normal individuals

Healthy residents at SVYASA or participants registered for positive health promotion at S-VYASA hospital- *Ārogyadhāma*, in *Anekal Tāluka*, Bangalore, Karnataka (matched for age and gender with diabetes group)

Twenty-seven Depression patients attending the S-VYASA, *Arogyadhama*, Yoga Medicine Health Home, diagnosed to have depression by a qualified psychiatrist, aged 30-50 years, Mean Age \pm S.D, 34.95 ± 8.25 , compared with forty-three 'healthy' adults

attending the same institution for health improvement, also aged 30-50 years, Mean Age \pm S.D, 40.72 ± 8.63 .

In all four studies, diagnosis, if required, was based on routine case histories, and S-VYASA clinical examination.

5.1.5 Pre-Post Acugrap3 Assessment after 7 & 14 days Yoga Intervention for Type 2 DM

Diabetes participants were from S-VYASA hospital *Ārogyadhāma*, in *Anekal Tāluka*, Bangalore, Karnataka.

5.1.6 Pre-Post Acugraph Assessment of SMET for Mangers

Participants in SVYASA's SMET program conducted in S-VYASA University.

5.2 INCLUSION CRITERIA

5.2.1 Baseline comparison of Type 2 DM and Normal Healthy on Acugraph

- S-VYASA patients diagnosed with T2DM; male or female; age range, 35 to 80years.
- Willing to participate in the study

5.2.2 Baseline comparison of Managers and Normal healthy on Acugraph

Participants in SVYASA's SMET program, willing to participate in the study; aged 30 to 50 years.

5.2.3 Baseline comparison of HIV infected children and non-infected children on Acugraph

- Children diagnosed as HIV infected; male or female; caretakers willing for them to participate in the study.

5.2.4 Baseline comparison of Depression and Healthy subjects on Acugraph

- Depression without further complications; willing to participate in the study; aged 30 to 50 years.

5.2.5 Pre-Post Acugraph Assessment after 7 & 14 days Yoga Intervention for Type 2 DM

- S-VYASA patients diagnosed with T2DM; male or female; age range, 35 to 80years.
- Willing to participate in the study.

5.2.6 Pre-Post Acugraph Assessment of SMET for Mangers

- Participants in SVYASA's SMET program willing to participate in the study; aged 30 to 50 years.

5.3 EXCLUSION CRITERIA

For all: any cut, scar or mole on the surface of a Jing well point; missing any finger or toe; excess perspiration; for females, pregnancy, or menstruation on day of measurement.

5.4 INFORMED CONSENT

In all four studies, the study protocol was explained to participants, and signed informed consent obtained from either participants or those responsible for them. For Type 2 DM groups, *Ārogyadhāma* informed consent was used. For all other groups including control groups, normal signed informed consent forms were used.

5.5 DESIGN

5.5.1 Baseline comparison of Type 2 DM, Managers, HIV, Depression with their respective Normal healthy on Acugraph

- Two group cross-sectional study design

5.5.2 Pre-Post Acugraph Assessment of 7 & 14 day Yoga Intervention for Type 2 DM

- Assessments were made on 1st day and 7th / 14th days: pre-post measurements

5.5.3 Pre-Post Acugraph Assessment of SMET for Mangers

- Measurements were made on the first and final days, pre-post the program.

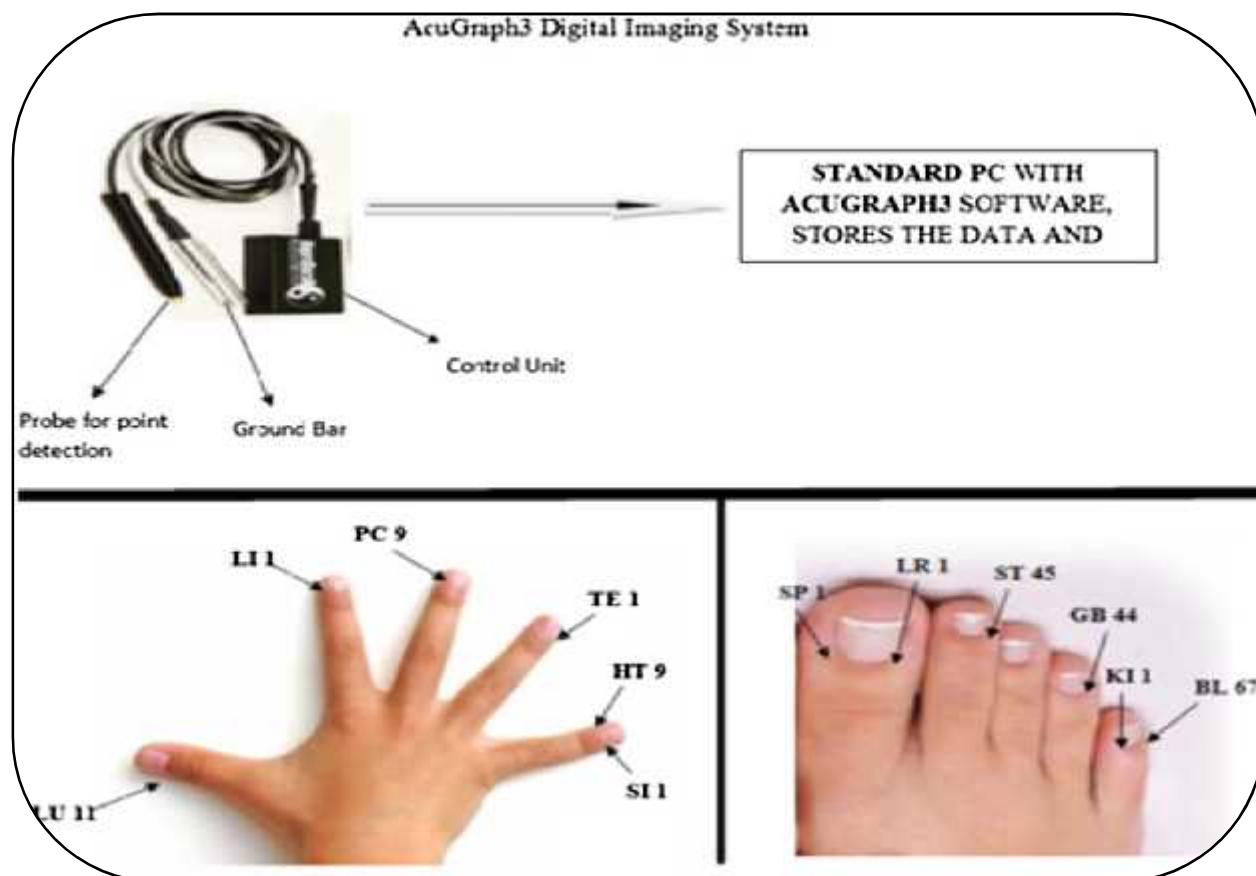
5.6 ASSESSMENT TOOLS

5.6.1 Primary outcome measure

AcuGraph: Assessments were made using the AcuGraph” Digital Meridian Imaging system. The AcuGraph system consists of a probe, ground bar, connection cable, software CD, user manual, and computer. Participants hold the ground bar while the probe is pressed to the acupuncture meridian point, so that electrodermal impedance is measured. For

diabetic subjects, blood tests were also taken on the first and final days of the 7 / 14 day intervention period.

PLATE 1: ACUGRAPH- DIGITAL MERIDIAN TOOL



AcuGraph 24 Jing-Well acupuncture points are located at the end of left and right branches of each 12 main acupuncture meridians.

In this study, AcuGraph was used to measure the flow of subtle *prāṇa* energy in the twelve main meridians. Its measured values of dermal conductance are interpreted as the amount of Qi or *prāṇa* energy flow in each meridian, Left and Right, on the two sides of the body, as follows:- Lung (Lu_L , Lu_R); Pericardium (Pc_L, Pc_R); Heart (Ht_L, Ht_R); Small intestine (Si_L, Si_R); Triple warmer (Te_L, Te_R); Large intestine (Li_L,

Li_R); Spleen (Sp_L, Sp_R); Liver (Lr_L, Lr_R); Kidney (Ki_L, Ki_R); Bladder (Bl_L, Bl_R); Gall Bladder (Gb_L, Gb_R); and Stomach (St_L, St_R).

5.6.2. Secondary outcome measures

Blood Sugar

Diabetes is characterized by failure to absorb blood sugar into the tissues normally due to Insulin Resistance. The main types of blood glucose test are.

- Fasting blood sugar (FBS) measures blood glucose after at least 8 hours without food - fasting. It is often the first test done to check for pre-diabetes and diabetes. The Fasting Blood Sugar level on an empty stomach taken on waking up in the morning should be between 80 and 120 mg/dl, considered the normal range.
- The Post-Prandial Blood Sugar (PPBS) test measures blood glucose level exactly 2 hours after finishing a meal. Normal PPBS should be between 120 to 160 mg/dl.

We took FBS and PPBS measurements on the first and final days both groups – 1st and 7th for the 7 day group, and the 1st and 14th days for the 14 day group.

5.7 SAMPLE SIZE CALCULATION

Considering medium effect size (0.5) sample size was calculated keeping alpha at 0.05 and power at (0.8) the required sample size was calculated was 34.

CHAPTER – 6
DATA EXTRACTION AND
ANALYSIS

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6.0 DATA EXTRACTION AND ANALYSIS

6.1 DATA COLLECTION

All data were collected using Acugraph under direction of its computer software program installed for numerical measurement of conductance. Consent forms and demographic data were obtained in pen and paper format. Demographic data for experimental subjects in the Type 2 DM and Depression studies was taken from *Arogyadhama* Health Home patient record sheets. That for the Managers Participating in SMET programs conducted at SVYASA University campus came from SMET program record sheets, and that for the HIV study subjects came from records at the Belgaum rehabilitation home for HIV Infected children.

6.2 DATA SCORING

The Acugraph program automatically generates and stores subject information and data under the heading, 'subject'. The output can be converted into a pdf file for each subject separately.

6.3 DATA ANALYSIS

Data were variously analyzed using SPSS 16.0, MS Excel 2007, and GraphPad. Baseline comparison of Type 2 DM, Managers, HIV, and Depression with their respective Normal healthy groups were compared using Independent sample t-test.

Pre-post changes in Pre-Post Acugrap³ Assessment of 7 & 14 day Yoga Intervention for Type 2 DM and Pre-Post Acugraph Assessment of SMET for Managers were estimated using paired sample t-tests.

CHAPTER – 7

RESULTS

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7.0 RESULTS

7.1

Table 4
Baseline comparison of Type 2 DM and Normal healthy

Meridians	Type 2 DM	Normal healthy	p value
LU_L	80.54±32.39	82.45±22.89	.613
LU_R	74.36±31.89	80.87±22.04	.078
PC_L	74.4±28.67	73.95±16.20	.884
PC_R	64.65±26.4	73.72±17.22	.003
HT_L	69.85±30.51	70.87±15.91	.748
HT_R	67.38±25.26	76.92±17.91	.001
SI_L	73.42±32.19	75.66±19.45	.525
SI_R	69.89±28.39	74.38±20.8	.183
TE_L	73.11±30.06	74.61±17.19	.642
TE_R	70.66±30.69	76.24±19.19	.103
LI_L	72.83±28.47	72.64±15.19	.948
LI_R	66.95±26.62	72.56±16.45	.058
SP_L	53.20±29.86	70.99±18.34	<0.001
SP_R	48.91±29.52	67.35±19.42	<0.001
LR_L	54.23±30.54	72.49±18.39	<0.001
LR_R	52.34±28.42	69.76±18.52	<0.001
KI_L	42.82±28.27	61.08±15.92	<0.001
KI_R	42.45±26.97	62.14±18.96	<0.001
BL_L	40.69±26.48	63.07±19.15	<0.001
BL_R	43.28±27.40	64.28±20.21	<0.001
GB_L	48.69±29.78	69.22±18.19	<0.001
GB_R	47.62±28.10	70.80±20.13	<0.001
ST_L	53.45±29.76	70.66±18.41	<0.001
ST_R	51.44±30.14	70.73±19.57	<0.001

Table 4 compares group means and SDs for the 24 meridians for T2DM and Normal Healthy groups. All results for the lower meridians were $p < 0.001$. Only two upper meridians, PC_R and HT_R, reached significance $p < 0.05$

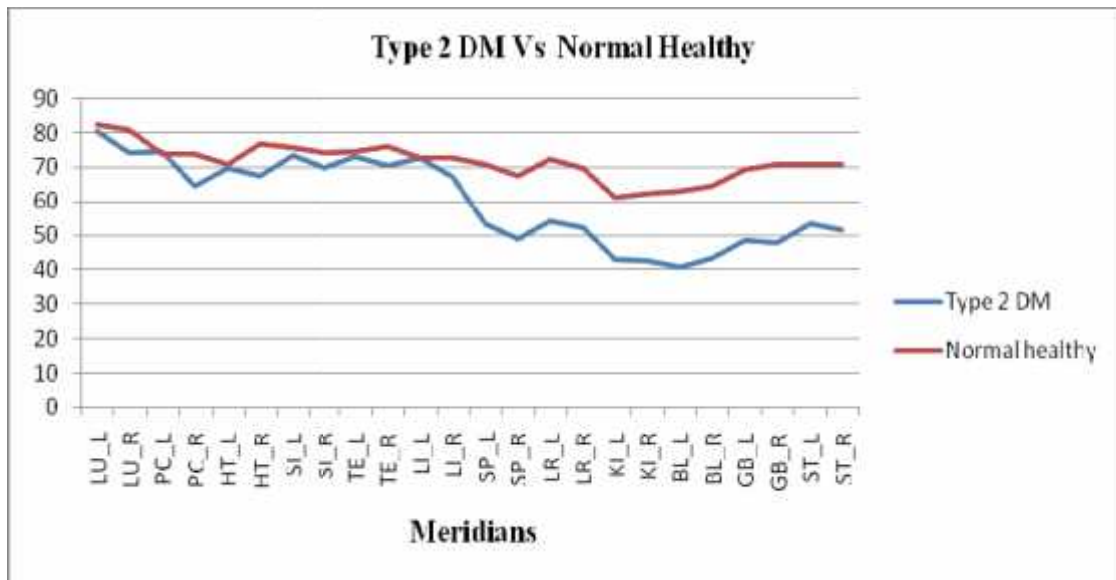


Fig 5: Comparison of Mean between Type 2 DM vs. Normal Healthy from Table 4

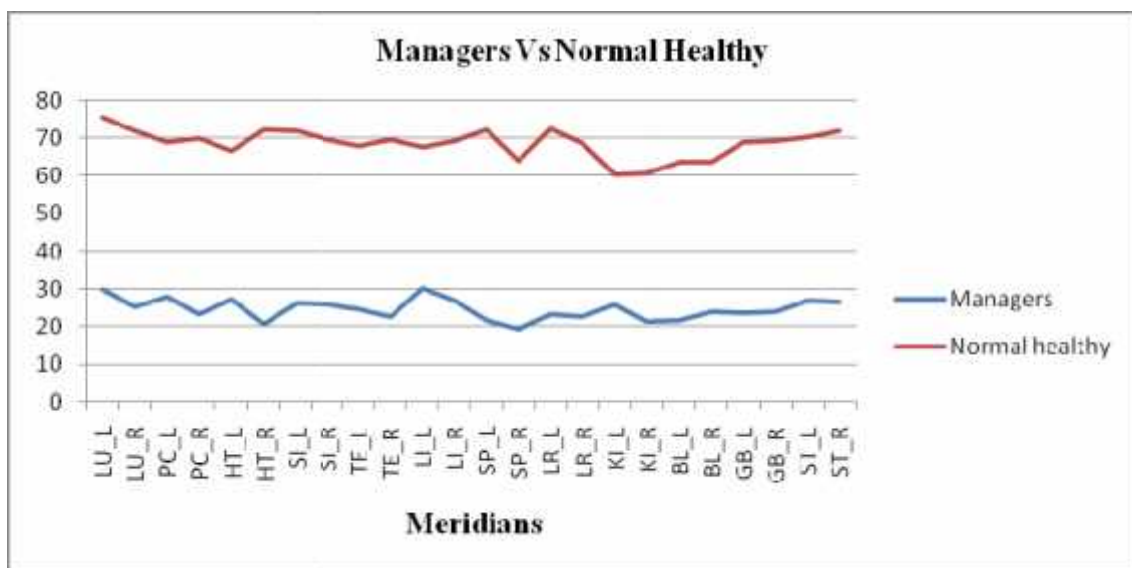


Fig 6: Comparison of Mean between Managers vs. Normal Healthy from Table 5

7.2

Table 5
Baseline comparison of Managers and Normal Healthy

Meridians	Managers	Normal healthy	p value
LU_L	30.04±12.70	75.49±13.35	<0.001
LU_R	25.29±11.05	72.04±11.37	<0.001
PC_L	28.00±10.76	69.05±12.16	<0.001
PC_R	23.42±10.15	70.07±15.21	<0.001
HT_L	27.42±15.81	66.62±11.29	<0.001
HT_R	20.89±8.54	72.36±13.57	<0.001
SI_L	26.40±12.65	71.95±12.75	<0.001
SI_R	26.00±10.27	69.75±16.67	<0.001
TE_L	24.76±12.91	68.00±9.65	<0.001
TE_R	22.58±8.67	69.53±15.79	<0.001
LI_L	30.27±10.69	67.82±13.08	<0.001
LI_R	26.93±10.71	69.38±14.56	<0.001
SP_L	21.87±11.85	72.11±18.87	<0.001
SP_R	19.47±9.66	64.25±18.09	<0.001
LR_L	23.38±11.10	72.58±20.35	<0.001
LR_R	22.76±13.08	68.69±21.15	<0.001
KI_L	26.00±19.78	60.51±15.73	<0.001
KI_R	21.42±10.16	60.80±18.80	<0.001
BL_L	21.91±10.14	63.80±23.06	<0.001
BL_R	23.96±11.67	63.67±22.74	<0.001
GB_L	23.60±11.27	69.09±20.86	<0.001
GB_R	24.00±10.55	69.38±21.79	<0.001
ST_L	27.11±15.15	70.36±19.07	<0.001
ST_R	26.67±13.76	71.85±21.09	<0.001

Table 5 Presents group means and SDs for individual meridians for Managers and Normal Healthy groups.

In contrast to Table 4 for DM, here statistical significances were $p < 0.001$ for all the 24 meridians.

Table 4 presents Baseline Acugraph measures for the Type 2 DM and Normal Healthy groups and their statistical comparison. Results were significantly different $p < 0.001$ for all the lower meridians, and in two upper right side meridians. These reflect the large

Upper-Lower imbalance for the T2DM group, and also their strong Left-Right imbalance in upper meridians, as observed previously (B Sharma, Hankey, Meenakshy, et al., 2014) Table 5 presents the baseline data for the Managers and their Normal Healthy comparison group, and their statistical differences. The managers showed a very low range of mean values in their meridians compared to Normal healthy group, p values <0.001 for all 24 meridians, but there were no significant Upper-Lower or Left-Right imbalances like those in the T2DM group.

7.3 BASELINE COMPARISON OF HIV INFECTED CHILDREN AND NON-INFECTED CHILDREN ON ACUGRAPH

Results for individual meridians are given in Table 6a, which presents meridian averages and standard deviations for each meridian for both HIV and normal groups of children. As can be seen, the normal children had higher conductance values for every meridian, and independent 't' tests gave significant p values for every meridian except for the Triple Energizer Right (TE_R) (p = 0.139) and the Liver Right (LI_R) (= 0.077), the differences between HIV and normal for both of which were more than 12 points. Applying the sign test to all 24 meridians, the probability against the null hypothesis being correct is $p \ll 0.0001$, so we can reasonably state that the HIV children showed lower readings on *all* meridians than the normal children, despite two not reaching t test significance. Table 6b shows that they also had higher values of U_L and L_R imbalances, lower values of Energy Stability and P.I.E. variables, indicating poor health.

TABLE 6a
Individual meridian differences between HIV positive and normal children

Meridian	HIV Children Mean \pm SD	Normal Children Mean \pm SD	p-Value
LU-L	141.81 \pm 34.53	161.66 \pm 28.32	0.007
LU-R	121.86 \pm 38.18	149.71 \pm 34.80	0.001
PC-L	122.71 \pm 34.52	146.80 \pm 31.67	0.002
PC-R	118.29 \pm 34.30	139.26 \pm 35.84	0.011
HT-L	113.71 \pm 35.16	133.37 \pm 38.22	0.023
HT-R	117.76 \pm 40.48	141.66 \pm 39.21	0.011
SI-L	123.19 \pm 35.76	144.17 \pm 33.83	0.010
SI-R	117.24 \pm 35.43	140.91 \pm 37.63	0.006
TE-L	118.52 \pm 33.78	137.54 \pm 33.68	0.016
TE-R	122.29 \pm 36.25	134.86 \pm 37.35	0.140
LI-L	128.86 \pm 30.30	146.97 \pm 32.21	0.014
LI-R	125.19 \pm 36.91	138.86 \pm 28.44	0.071
SP-L	113.81 \pm 43.19	149.03 \pm 40.43	<0.001
SP-R	105.62 \pm 44.90	148.69 \pm 37.61	<0.001
LR-L	118.90 \pm 43.80	150.17 \pm 38.37	0.001
LR-R	114.10 \pm 47.53	152.74 \pm 40.39	<0.001
KI-L	106.81 \pm 38.88	134.74 \pm 42.45	0.004
KI-R	110.81 \pm 44.60	142.80 \pm 35.32	0.001
BL-L	104.14 \pm 36.02	142.46 \pm 36.76	<0.001
BL-R	108.57 \pm 37.53	149.89 \pm 35.99	<0.001
GB-L	116.05 \pm 34.91	147.37 \pm 38.74	<0.001
GB-R	115.05 \pm 39.20	151.83 \pm 35.78	<0.001
ST-L	126.14 \pm 39.84	154.40 \pm 35.51	0.002
ST-R	120.14 \pm 41.02	161.89 \pm 36.46	<0.001

Table 6a Caption: Table 6a compares group means and standard deviations for the 24 meridians for HIV positive and normal children group. Means were lower for all meridians, significantly different between the groups, $p < 0.05$, for all meridians except TE_R (0.14) and LI_R, (0.071). For the lower meridians, significances were all $p < 0.005$

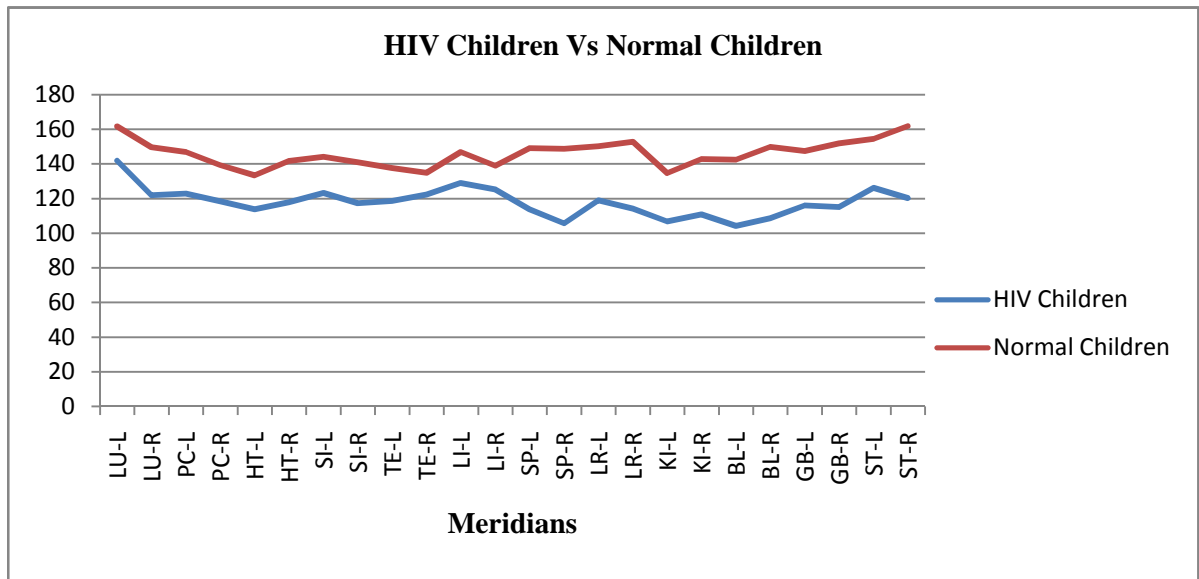


Fig 7: Comparison of Mean between HIV Children vs. Normal Children from Table 6a

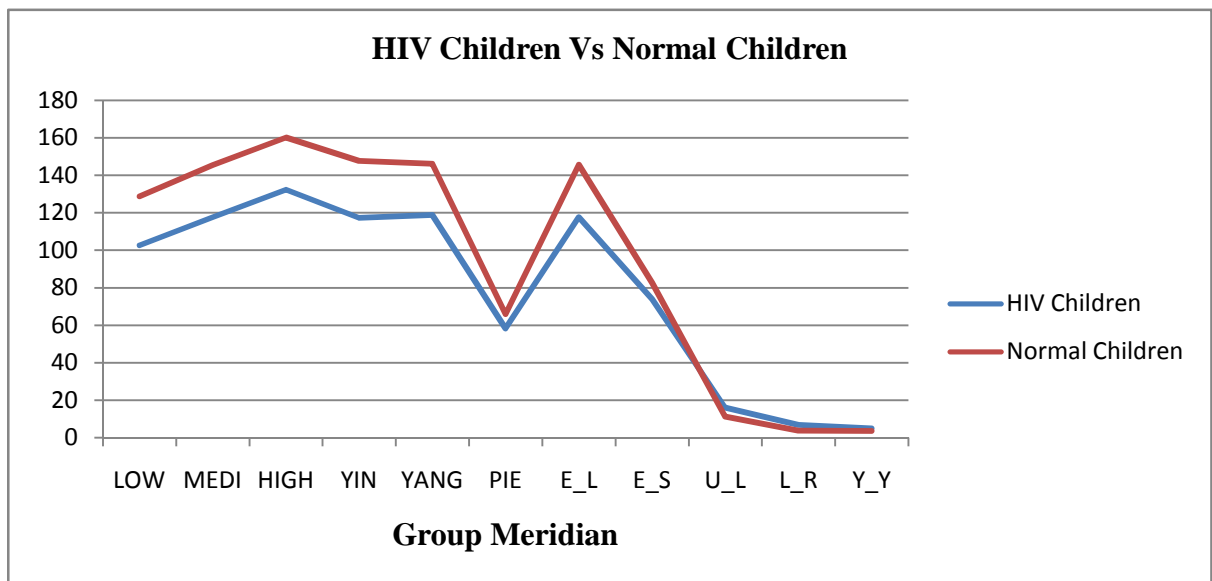


Fig 8: Comparison of Mean between HIV Children vs. Normal Children from Table 6b

TABLE 6b
Meridian Grouping averages: differences between HIV positive and normal children

Meridian	HIV Children Mean ± SD	Normal Children Mean ± SD	p-Value
LOW	102.50±31.22	128.71±28.61	<0.001
MEDI	117.50±31.22	145.49±30.42	<0.001
HIGH	132.24±30.59	160.09±28.63	<0.001
YIN	117.31±33.04	147.69±32.51	<0.001
YANG	118.74±29.70	146.03±30.20	<0.001
PIE	58.24±14.95	65.89±15.10	0.029
E_L	117.50±31.22	145.57±30.34	<0.001
E_S	73.88±12.67	82.57±11.94	0.003
U_L	16.17±12.86	11.34±8.33	.051
L_R	6.88±5.37	3.86±3.22	.003
Y_Y	5.05±4.10	3.63±3.61	.111

Table 6b Caption: Table 6b compares group means and standard deviations for meridian groupings for the HIV positive and normal children groups. t tests on all groupings were significant, except Yin-Yang imbalance, U_L and Y_Y (0.111) – Significance in the difference for Upper-Lower imbalance, U_L, was borderline, 0.051.

7.4 BASELINE COMPARISON OF DEPRESSION AND HEALTHY SUBJECTS

Tables 7a and 7b present group means and SDs of all the individual meridians (Table 7a) and various derived and average variables (Table 7b); also giving t and F test comparison values. The depression group's Means and SD's are *both* significantly larger for *all* meridians, a significant result *in toto*, apart from it being highly significant for each meridian individually.

Table 7a

Group Averages and Standard Deviations for 24 Meridians

Group Meridian	Depression		No Pathology		Indep. Sample t test	p Value	Levene's F
	Mean	SD	Mean	SD			
LU-L	111.41	38.03	77.44	19.56	4.30	<0.001	13.05
LU-R	103.56	44.62	73.21	19.91	3.33	<0.001	20.07
PC-L	105.70	40.46	70.23	16.13	4.34	<0.001	24.26
PC-R	99.04	39.61	69.49	17.76	3.65	<0.001	13.79
HT-L	106.89	43.65	66.70	14.67	4.62	<0.001	36.36
HT-R	107.78	39.66	72.65	16.59	4.37	<0.001	17.15
SI-L	96.59	44.50	71.77	15.52	2.79	0.01	17.15
SI-R	108.00	47.46	70.33	19.68	3.92	<0.001	22.15
TE-L	107.48	44.24	69.35	14.02	4.34	<0.001	29.15
TE-R	109.93	45.09	70.56	18.15	4.32	<0.001	29.77
LI-L	99.63	36.50	68.60	14.42	4.22	<0.001	22.81
LI-R	101.70	34.10	69.21	16.73	4.62	<0.001	14.11
SP-L	109.85	52.82	67.95	20.43	3.94	<0.001	34.04
SP-R	107.33	59.39	62.23	18.55	3.83	<0.001	74.82
LR-L	116.37	55.88	71.26	19.33	4.05	<0.001	33.84
LR-R	109.63	56.24	66.47	20.98	3.82	<0.001	45.72
KI-L	86.22	51.4	58.00	16.08	2.77	0.01	46.88
KI-R	86.89	51.18	57.58	20.58	2.84	0.01	21.08
BL-L	83.11	43.17	58.56	23.9	2.71	0.01	7.67
BL-R	80.89	44.27	59.44	25.12	2.30	0.03	10.82
GB-L	94.89	52.98	63.49	21.73	2.93	0.01	23.85
GB-R	90.67	48.68	64.84	23.24	2.58	0.01	20.45
ST-L	101.04	50.95	68.56	19.85	3.17	<0.001	31.64
ST-R	104.00	55.02	67.77	21.31	3.27	<0.001	38.29

Table 7a Caption: Table 7a presents group means and SDs for individual meridians for Depression and No Pathology groups. Means for the first are mostly in the ideal range of 90 to 108. The No Pathology

group had far lower means, range 57-77, probably reflecting the average citizen's high level of disease susceptibility. Group SDs for the Depression group were very high; those of the No Pathology group were far lower. Differences between means were all highly significant, as shown in the 't' and p value columns; F values were also all highly significant, all $p < 0.0001$, except for BL_L, $p < 0.0003$. Meridian properties of the two groups are completely distinct.

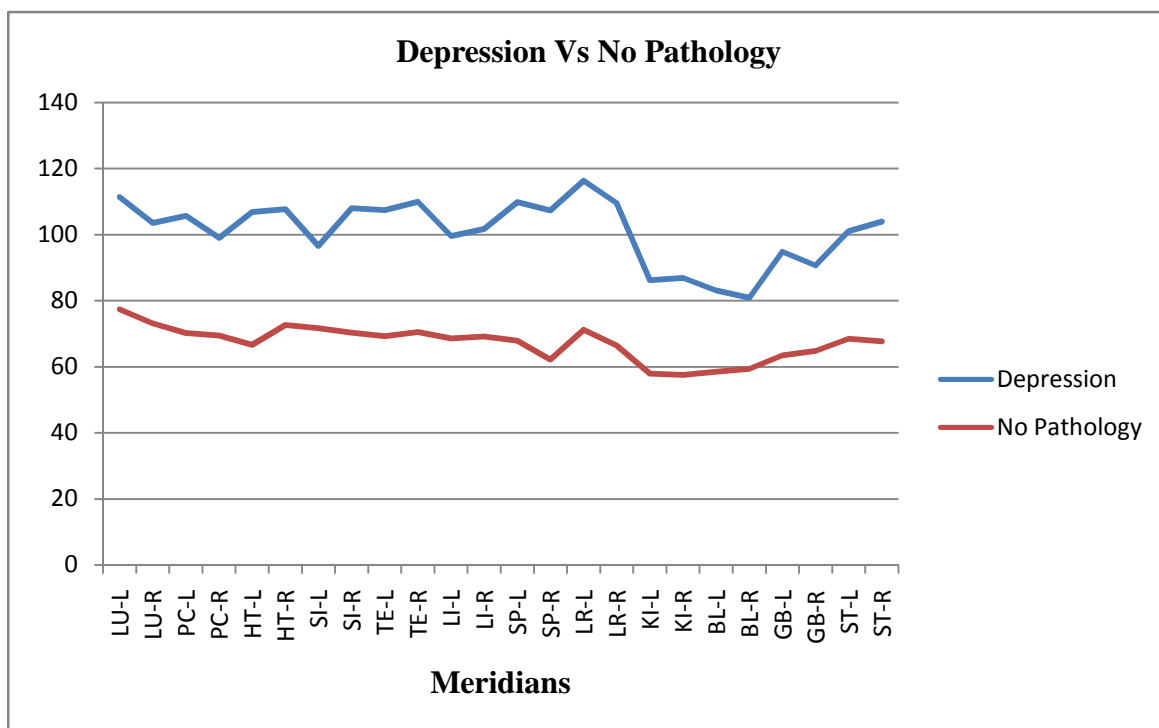


Fig 9: Comparison of Mean between Depression vs No Pathology from Table 7a

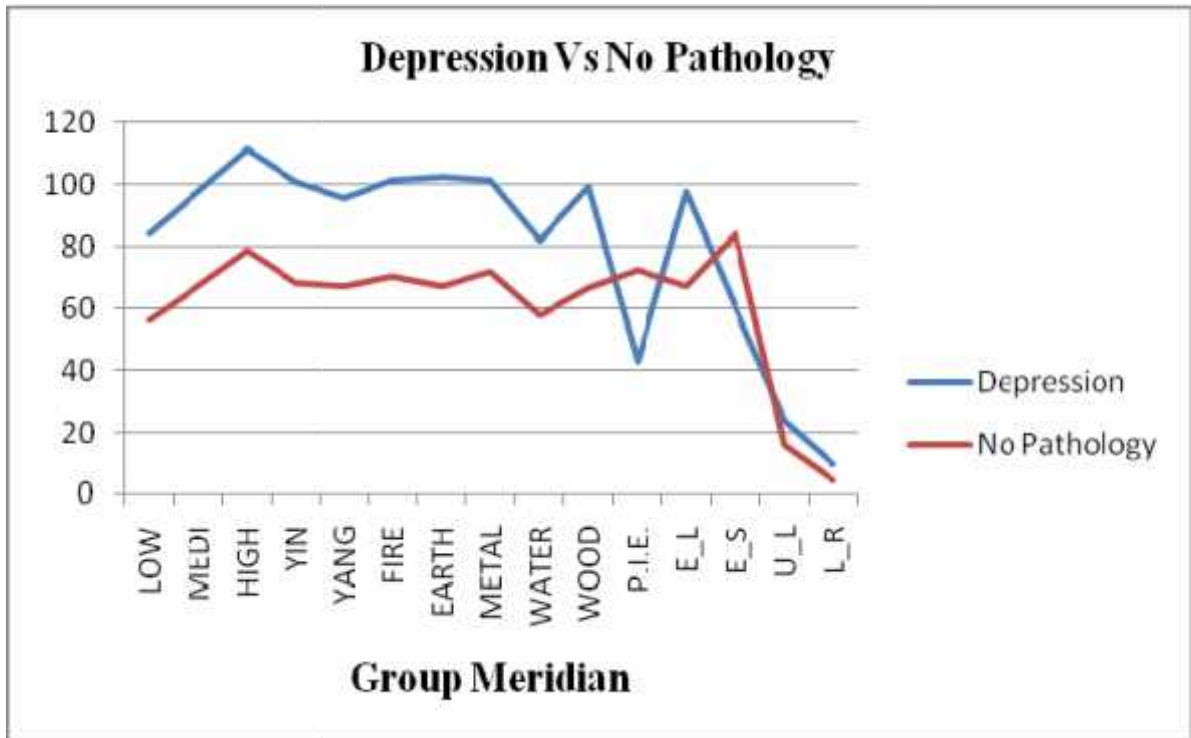


Fig 10: Comparison of Mean between Depression vs. No Pathology from Table 7b

Table 7b
Group Averages and Standard Deviations for Meridian Groupings
with Independent Sample t test and Levene's F test values

Group Variable	Depression		No Pathology		Indep. sample t test	p Value	Levene's F
	Mean	SD	Mean	SD			
LOW	84.15	32.12	56.07	11.80	4.38	<0.001	21.47
MEDIUM	97.67	34.50	67.47	13.42	4.37	<0.001	20.29
HIGH	111.41	36.86	78.95	14.16	4.40	<0.001	20.52
YIN	101.07	34.62	68.56	12.19	4.74	<0.001	31.03
YANG	95.44	35.40	67.37	13.95	3.94	<0.001	18.47
FIRE	101.48	33.05	70.44	13.77	4.72	<0.001	10.93
EARTH	102.70	45.61	67.23	5.68	3.86	<0.001	36.13
METAL	101.41	31.76	72.21	14.49	4.68	<0.001	15.79
WATER	81.74	42.95	57.84	19.75	2.62	0.01	16.02
WOOD	99.15	48.00	66.81	8.45	3.29	<0.001	37.95
P.I.E.	42.74	16.92	72.53	14.55	-7.42	<0.001	1.68
E_L	97.78	34.49	67.40	12.90	4.41	<0.001	21.23
E_S	60.11	16.71	84.21	10.63	-6.73	<0.001	10.2
U_L	23.59	16.41	15.81	14.29	2.16	0.04	1.49
L_R	9.56	9.28	4.30	3.61	2.73	0.01	16.48
Y_Y	9.85	7.46	4.60	5.60	3.03	<0.001	6.48

Table 7b Caption: Table 7b presents group means and standard deviations for meridian groupings for the Depression and No Pathology groups. Selected meridians, rows 1-5 are all low for the no pathology group; for the five 'element' meridian groupings, water is low in both groups; of the Balance variables, the No Pathology group was healthier than the Depression in all variables except Energy Level E_L, which was low like the selected meridians and 'element' meridians. t tests on all groupings were significant, as were all F tests except P.I.E. and Upper-Lower imbalance, U_L.

These significant differences carry over to the meridian groupings given in Table 7b, where all mean values are larger for the depression group except for Personal Integrated Energy (P.I.E.) and Energy Stability (E_S), where smaller values indicate ill-health. For the other imbalance variables (U_L, L_R and Y_Y), it is the other way round: larger values indicate health problems. Although high values of meridian energies and their principal averages make the depression group seem healthy, their problems are masked by the average process and show up in the imbalance variables and the PIE and Energy Stability variables. These make it clear that, in reality, the group is less healthy.

To clarify just how different the two groups were, Table 8a displays the ranges of the Meridian Group Means and SD's for each group. The two pairs of ranges are well separated! Table 8b displays the ranges for the mean and SDs of the 24 meridians for individuals.

Table 8a
Ranges of Meridian Group Means and SD's
for No Pathology & Depression Groups

Group	Group mean	Group sd
Depression	80.89 to 111.41	34.10 to 59.39
No pathology	57.58 to 77.44	14.02 to 25.12

Table 8a Caption: Table 8a presents the ranges of the Group Means and Standard Deviations for meridians given in Table 7a. This makes it clear that the ranges of both Means and SD's for the Depression group are higher than, and clearly separated from, those for the No Pathology group. Both pairs of datasets

are distinct with gaps of several units in between them. The two distributions have completely different characteristics.

Table 8a summarizes the data from Table 7a by presenting the range of meridian group mean energies, and standard deviations showing that there was no overlap between the pairs of distributions. Each pair is well separated and completely distinct. The Depression patients had higher group mean electrodermal conductance levels in all meridians, For the standard deviations, the depression group's values were all far higher than the control group's with no overlap at all. This shows that their meridian properties were much less well regulated, and subject to high levels of fluctuation. By comparison, the 'no pathology' controls showed considerably lower conductance levels at all meridian Jing-Well points, but also much lower group variances, indicating greater stability.

Table 8b

**Ranges of Means and SD's of values for the 24 meridians
for individuals in the No Pathology & Depression Groups**

Group	Individual Mean	Individual SD
No pathology	35.67 to 103.92	6.22 to 32.45
Depression	21.83 to 172.08	11.48 to 49.23

Table 8b Caption: Table 8b presents the ranges of the Means and Standard Deviations of values from all 24 meridians, for each individual participant. It shows that for the Depression group, means of the 24 meridian values varied over the range, 21 to 172, far greater than, and including, the range for the No

Pathology group, 35 to 104. The range of the Depression group's SD's was about 44% larger than the No Pathology group's.

Table 8b presents a similar analysis of data from individual subjects, the ranges of their mean conductance levels (E_L), and the standard deviations of all 24 meridian

conductance levels. It shows, first, that the range of the Depression group's means conductances include the range of the normal group's – they are much more variable; and, second, that the standard deviations, or range of variability of individual meridian conductances is about 45% higher.

Because of the higher values of the Upper Lower imbalance for the Depression group given in Table 7b, it is not clear that the differences in SD's between the two groups given in Table 8b are due to intrinsic differences in SD or are primarily due to differences between sets of Upper and Lower meridians. We therefore calculated the group total variances of the upper and lower meridian values separately. These are presented in Table 9, which shows that the mean variance for the upper meridians of the depression patients was over five times higher than that of the healthy controls, and almost five times higher for the lower meridians.

**Mean Variances of Upper and Lower Meridians
for the Depression and No Pathology Control Groups**

Meridians	Depression	No pathology
Upper	666.2	109.1
Lower	904.4	184.8

Table 9 Caption: Table 9 presents the mean variances of the upper and lower meridians for the two groups.

Depression results in far greater variability in conductance at Jing-Well points. Variability in conductance values is therefore far higher for both upper meridians and lower meridians for the Depression group than for the No Pathology group, confirming Table 8b.

Table 10
Baseline data for Type 2 DM, Managers, HIV and Depression data compared to their respective Normal Healthy Groups

DM (N=130)				HEALTHY (N=85)			
MIN	MAX	MEAN	SD	MIN	MAX	MEAN	SD
40.69	80.54	59.88	12.68	61.08	82.45	71.56	5.34
ONGC (N=45)				HEALTHY (N=55)			
19.47	30.27	24.76	2.81	60.51	75.49	68.72	3.79
HIV (N=42)				HEALTHY (N=35)			
104.14	141.81	117.98	8.25	133.37	161.89	145.91	7.70
DEPRESSION (N=27)				HEALTHY (N=43)			
80.89	116.37	101.19	9.64	57.58	77.44	67.32	5.16

Table 10 Caption: Table 10 presents minimum, maximum, mean, and SD's for the meridian values for T2DM Patients, ONGC Managers, HIV Children, and Depression Patients, and their respective control groups.

Table 10 presents the baseline normative value for Type2 DM, ONGC, HIV and Depression compared with their respective healthy population. The Range and mean for Type 2DM study compared with normal healthy the minimum range and mean were 61.08 where as healthy mean range was 40.69. The Range and mean for ONGC group were lower than their respective healthy group with the age range between 30 to 60. In depression group the minimum was 80.89 and in healthy maximum were 57.58 with the

age range of 20 to 60. In HIV infected children mean and range were 104.14 and for no infected children 133.37 respectively.

7.5 PRE-POST ACUGRAPH ASSESSMENT AFTER 7 AND 14 DAYS YOGA INTERVENTION FOR TYPE 2 DM

7.5.1 Seven Days Yoga Intervention

Table 11a presents pre and post data and significance of changes for Skin Conductances at Jing-Well points on the fingers (Primary Outcome Variables) for the 7-Day Yoga Intervention. The group mean increased for all 12 meridians (Sign Test significance $p < 0.00025$) showing a highly significant tendency for all upper meridians to improve. Only Large Intestine and Heart meridians (in both cases Left and Right) individually reached statistical significance, $p < 0.05$. Table 11b presents pre and post data and significance of changes for conductances at Jing-Well points on the toes (also Primary Outcome Variables) for the 7-Day Yoga Intervention. For these lower meridians, all mean conductances increased significantly ($p < 0.01$) with effect sizes ranging from 0.29 to 0.49. The greater improvement in the lower meridians meant that upper-lower (U_L) imbalances were reduced. All Meridian Average variables except energy stability (E_S), left right balance (L_R), and Yin /Yang balance (Y_Y) improved significantly ($p < 0.05$).

7.5.2 Fourteen Days Yoga Intervention

Table 12a presents pre and post data for upper meridians for the 14 day yoga intervention participants together with statistical analysis of observed changes. Surprisingly, changes are smaller than for the 7 day data: only 10 out of 12 showed increases, but this still yields a significant sign test p value for the general tendency to improve, $p < 0.016$. In

contrast to the 7 day data, none reached significance. For the lower meridians (Table 11b) all showed significant improvement $0.053 > p > 0.007$, except SP_R, LR_R and BL_R meridians, which did improve, but failed to reach significance. Meridians SP_L ($p=0.02$) and ST_L ($p=0.007$) improved most. Of the meridian average variables, only U_L balance improved significantly ($p = 0.013$) with effect size 0.32 (Table 12c).

7.5.3 Secondary Outcome Variables: physiological variables

In the 7-day data (Table 13a), all variables improved significantly post-intervention ($p<0.05$), except diastolic and systolic blood pressure (SBP & DBP) which showed strong trends $p = 0.089$ and 0.085 respectively. In the 14-day data (Table 13b), improvements were observed in all measures, all highly significant ($0.0001 < p < 0.025$), except Fasting Blood Sugar (FBS), $p = 0.048$, and Diastolic Blood Pressure (DBP) (NS).

TABLE 11a
Primary Variables for 7 Day Participants: Upper Meridians

Meridian		Mean \pm SD	N	't'	p value	ES
LU_L	PRE	79.91 \pm 33.91	70	-1.25	0.217	0.15
	POST	84.89 \pm 33.92				
LU_R	PRE	73.64 \pm 29.28	70	-1.86	0.067	0.22
	POST	80.77 \pm 33.53				
PC_L	PRE	72.83 \pm 27.98	70	-1.52	0.134	0.18
	POST	77.86 \pm 27.45				
PC_R	PRE	63.29 \pm 23.57	70	-1.88	0.064	0.22
	POST	69.34 \pm 26.85				
HT_L	PRE	65.97 \pm 21.41	70	-2.69	0.009	0.31
	POST	74.71 \pm 24.63				
HT_R	PRE	64.80 \pm 24.08	70	-3.15	0.002	0.35
	POST	74.89 \pm 22.17				
SI_L	PRE	72.00 \pm 22.53	70	-1.09	0.281	0.13
	POST	75.97 \pm 30.91				
SI_R	PRE	67.57 \pm 24.87	70	-1.15	0.253	0.14
	POST	71.57 \pm 28.52				
TE_L	PRE	69.63 \pm 22.28	70	-1.37	0.176	0.16
	POST	74.26 \pm 28.45				
TE_R	PRE	68.00 \pm 23.37	70	-1.23	0.222	0.15
	POST	72.51 \pm 29.88				
LI_L	PRE	70.57 \pm 22.07	70	-2.28	0.026	0.26
	POST	76.86 \pm 25.95				
LI_R	PRE	64.63 \pm 23.03	70	-3.06	0.013	0.35
	POST	72.54 \pm 25.44				

Table 11a Caption: Pre-post changes in Acugraph parameters over a 7-day IAYT program for Upper Meridians. All meridians improved: both Left and Right improved significantly $p < 0.05$, or Heart and Large Intestine; LU_R (0.067) and PC_R (0.064) showed good trends.

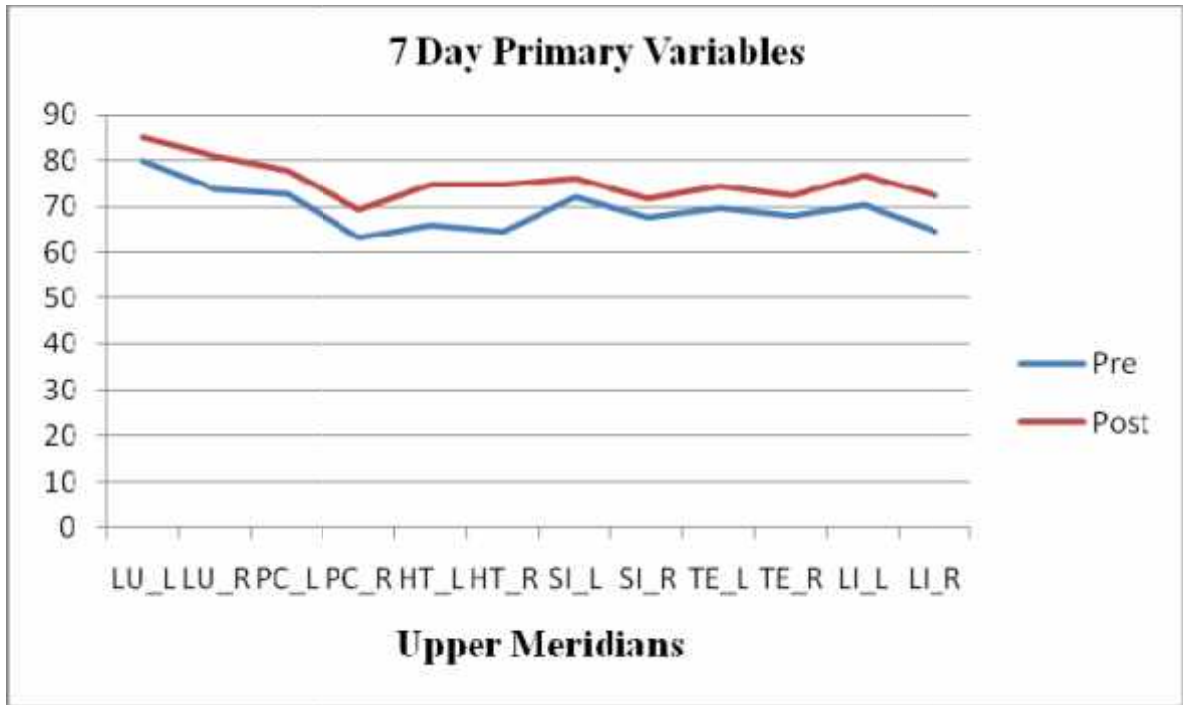


Fig 11: Pre post Comparison of Means of upper meridians after 7 days from Table 11a

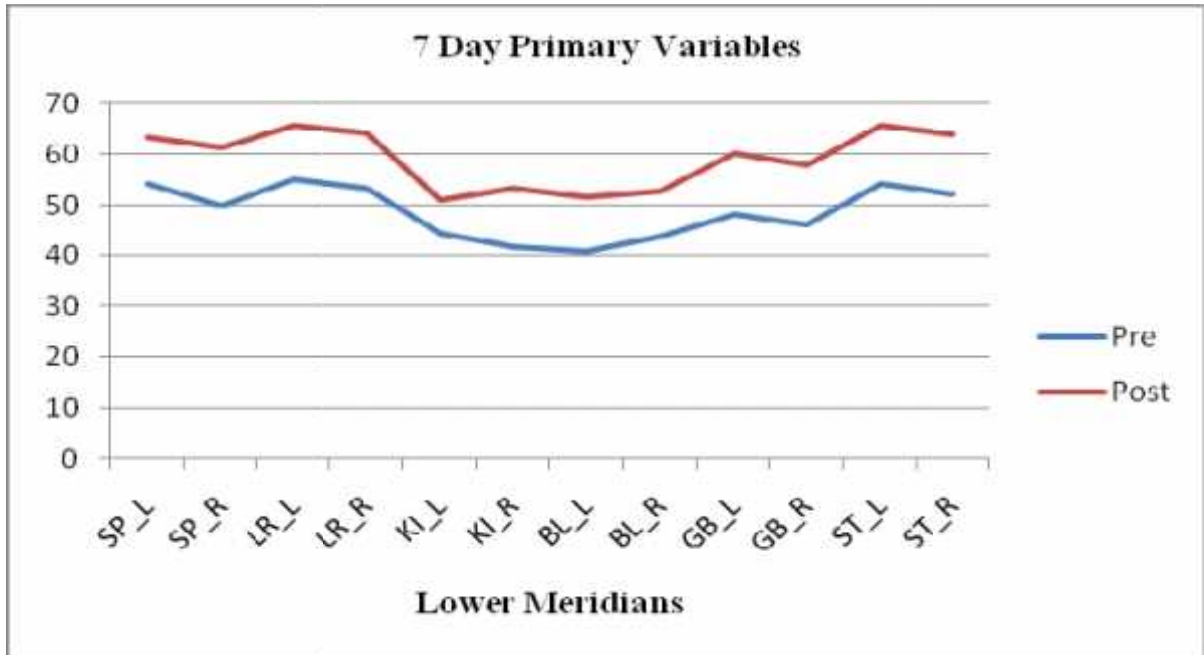


Fig 12: Pre post Comparison of Means of lower meridians after 7 days from Table 11b

TABLE 11b
Primary Variables for 7 Day Participants: Lower Meridians

Meridian		Mean \pm SD	N	't' Value	p Value	ES
SP_L	PRE	54.23 \pm 21.52	70	-2.556	0.013	0.29
	POST	63.26 \pm 30.33				
SP_R	PRE	49.91 \pm 27.03	70	-3.521	0.001	0.39
	POST	61.23 \pm 28.67				
LR_L	PRE	55.09 \pm 27.56	70	-3.405	0.001	0.38
	POST	65.64 \pm 29.68				
LR_R	PRE	53.49 \pm 24.89	70	-3.454	0.001	0.38
	POST	64.31 \pm 28.89				
KI_L	PRE	44.34 \pm 26.79	70	-2.381	0.02	0.28
	POST	50.86 \pm 23.14				
KI_R	PRE	41.89 \pm 25.46	70	-4.116	0.00	0.44
	POST	53.14 \pm 22.20				
BL_L	PRE	40.91 \pm 25.33	70	-4.716	0.00	0.49
	POST	51.40 \pm 24.79				
BL_R	PRE	43.86 \pm 27.54	70	-2.996	0.004	0.34
	POST	52.54 \pm 26.37				
GB_L	PRE	48.26 \pm 28.86	70	-3.88	<0.001	0.42
	POST	60.14 \pm 29.50				
GB_R	PRE	46.23 \pm 27.31	70	-4.313	<0.001	0.42
	POST	57.83 \pm 24.89				
ST_L	PRE	54.23 \pm 29.83	70	-3.196	0.002	0.36
	POST	65.71 \pm 30.23				
ST_R	PRE	52.21 \pm 28.95	70	-4.236	<0.001	0.45
	POST	64.03 \pm 28.11				

Table 11b Caption: Pre-post changes in Acugraph parameters for lower meridians over a 7-day IAYT program. All the lower meridians significantly improved in chi energy, $p < 0.05$.

TABLE 11c
7 Day Group Meridian Averages

Meridian		Mean \pm SD	N	't' Value	p Value	ES
LOW	PRE	48.29 \pm 21.34	70	-3.510	0.001	0.39
	POST	55.57 \pm 18.25				
MEDIUM	PRE	58.50 \pm 23.53	70	-3.583	0.001	0.40
	POST	66.49 \pm 20.11				
HIGH	PRE	68.96 \pm 25.73	70	-3.790	<0.001	0.42
	POST	78.40 \pm 21.70				
YIN	PRE	60.19 \pm 23.43	70	-3.601	0.001	0.40
	POST	68.50 \pm 19.90				
YANG	PRE	58.43 \pm 23.86	70	-3.453	0.001	0.38
	POST	66.41 \pm 20.71				
PIE	PRE	57.79 \pm 16.02	70	-2.268	0.026	0.26
	POST	62.07 \pm 17.04				
EL	PRE	58.76 \pm 23.50	70	-3.626	0.001	0.40
	POST	66.97 \pm 19.97				
ES	PRE	74.77 \pm 13.05	70	-1.202	0.234	0.14
	POST	76.69 \pm 12.84				
U_L	PRE	32.97 \pm 22.37	70	3.777	<0.001	0.41
	POST	23.37 \pm 17.49				
L_R	PRE	7.06 \pm 6.56	70	0.062	0.951	0.01
	POST	7.00 \pm 5.55				
Y_Y	PRE	7.83 \pm 7.13	70	-0.085	0.932	0.01
	POST	7.91 \pm 7.50				

Table 11c Caption: Pre-post changes in Acugraph parameters over a 7day IAYT program for meridian groupings. t tests on all groupings were significant $p < 0.005$, except ES, which showed a weak trend, and L_R, and Y_Y, which did not change at all.

TABLE 12a
Primary Variables for 14 Day Participants: Upper Meridians

Meridian		Mean \pm SD	N	't' Value	p Value	ES
LU_L	PRE	81.27 \pm 30.79	60	-0.161	0.873	0.02
	POST	82.03 \pm 28.53				
LU_R	PRE	75.20 \pm 30.11	60	-0.354	0.725	0.05
	POST	76.90 \pm 29.50				
PC_L	PRE	76.23 \pm 30.17	60	-0.455	0.650	0.06
	POST	78.60 \pm 31.66				
PC_R	PRE	66.23 \pm 26.00	60	-0.727	0.470	0.09
	POST	69.63 \pm 31.19				
HT_L	PRE	74.37 \pm 35.89	60	-0.035	0.972	<0.001
	POST	74.57 \pm 29.62				
HT_R	PRE	70.40 \pm 28.34	60	-1.214	0.230	0.16
	POST	76.50 \pm 31.60				
SI_L	PRE	75.07 \pm 33.82	60	-0.050	0.960	0.01
	POST	75.35 \pm 31.14				
SI_R	PRE	72.60 \pm 28.22	60	0.007	0.995	<0.001
	POST	72.57 \pm 28.90				
TE_L	PRE	77.17 \pm 31.59	60	0.441	0.661	0.06
	POST	74.93 \pm 32.04				
TE_R	PRE	73.77 \pm 31.57	60	-0.029	0.977	0.00
	POST	73.92 \pm 30.57				
LI_L	PRE	75.47 \pm 31.17	60	-0.710	0.480	0.09
	POST	78.87 \pm 30.72				
LI_R	PRE	69.67 \pm 27.90	60	-0.431	0.668	0.06
	POST	71.80 \pm 32.62				

Table 12a Caption: Pre-post changes over a 14 day IAYT program in Acugraph parameters for Upper Meridians. The program did not show significant change in any upper meridian, every $p > 0.05$.

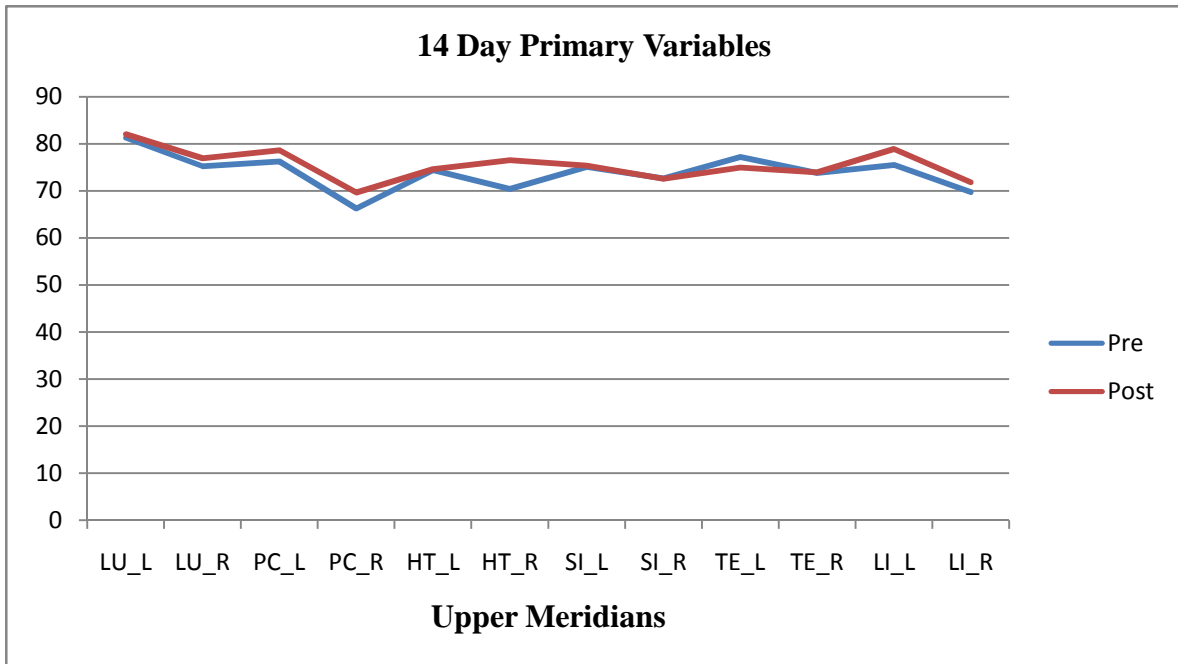


Fig 13: post Comparison of Means of upper meridians after 14 days from Table 12a

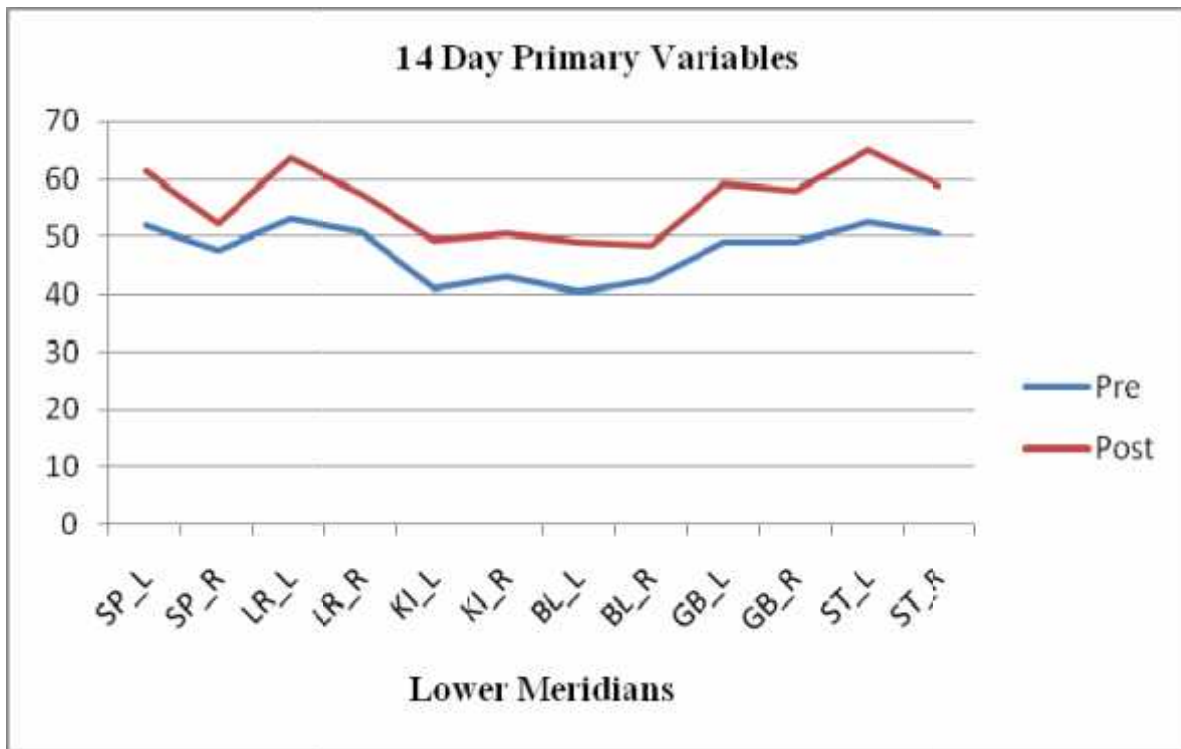


Fig 14: Post Comparison of Means of lower meridians after 14 days from Table 12b

TABLE 12b
Primary Variables for 14 Day Participants: Lower Meridians

Meridian		Mean \pm SD	N	't' Value	p Value	ES
SP_L	PRE	52.00 \pm 29.504	60	-2.222	0.03	0.28
	POST	61.37 \pm 36.459				
SP_R	PRE	47.73 \pm 30.684	60	-1.152	0.254	0.15
	POST	52.27 \pm 33.378				
LR_L	PRE	53.23 \pm 31.736	60	-2.389	0.02	0.3
	POST	63.80 \pm 34.855				
LR_R	PRE	51.00 \pm 27.790	60	-1.633	0.108	0.21
	POST	57.45 \pm 34.261				
KI_L	PRE	41.03 \pm 30.027	60	-2.226	0.03	0.28
	POST	49.47 \pm 30.795				
KI_R	PRE	43.10 \pm 28.836	60	-1.97	0.053	0.25
	POST	50.37 \pm 32.716 \pm				
BL_L	PRE	40.43 \pm 27.981	60	-2.184	0.033	0.27
	POST	48.97 \pm 29.823				
BL_R	PRE	42.60 \pm 27.438	60	-1.518	0.134	0.19
	POST	48.47 \pm 29.124				
GB_L	PRE	49.20 \pm 31.061	60	-2.081	0.042	0.26
	POST	59.23 \pm 35.591				
GB_R	PRE	49.23 \pm 29.137	60	-2.122	0.038	0.27
	POST	57.93 \pm 34.896				
ST_L	PRE	52.53 \pm 29.919	60	-2.78	0.007	0.34
	POST	65.23 \pm 37.362				
ST_R	PRE	50.53 \pm 31.69	60	-1.977	0.053	0.25
	POST	58.87 \pm 35.76				

Table 12b Caption: Pre-post changes over a 14 day IAYT program in Acugraph parameters for Lower Meridians. All the left meridians changed significantly, $p < 0.05$. Only one right meridian (GB_R) attained significance, $p = 0.038$, while two were borderline (ST_R and KI_R), $p = 0.053$, and one (LR_R) showed a trend, $p = 0.108$.

TABLE 12 c
14 Day Group Meridian Averages

Meridian		Mean ±SD	N	't' Value	p Value	ES
LOW	PRE	49.50±22.98	60	-1.352	0.181	0.16
	POST	54.18±25.65				
MEDIUM	PRE	60.70±24.95	60	-1.224	0.226	0.16
	POST	65.35±27.89				
HIGH	PRE	71.33±27.05	60	-1.231	0.223	0.18
	POST	76.30±29.51				
YIN	PRE	61.07±24.57	60	-1.373	0.175	0.16
	POST	66.12±27.52				
YANG	PRE	60.85±25.43	60	-1.216	0.229	0.17
	POST	65.60±28.42				
PIE	PRE	54.43±14.56	60	-1.356	0.180	0.16
	POST	57.32±13.83				
EL	PRE	60.48±24.93	60	-1.280	0.206	0.11
	POST	65.32±27.90				
ES	PRE	71.93±13.17	60	-0.821	0.415	0.32
	POST	73.73±11.79				
U_L	PRE	37.57±18.95	60	2.559	0.013	0.32
	POST	29.82±19.53				
L_R	PRE	7.07±5.77	60	-0.678	0.501	0.09
	POST	7.82±7.11				
YIN/YANG	PRE	6.12±4.83	60	-0.370	0.712	0.05
	POST	6.48±5.76				

Table 12c Caption: Pre-post changes over a 14 day IAYT program in Acugraph Meridian Grouping parameters. In contrast to the changes for the 7 day course, where most changed significantly (Table 11c), here only upper lower imbalance (U_L) changed significantly $p < 0.05$.

TABLE 13a
Secondary Variables for 7 Day Participants

Variable		Mean \pm SD	N	't' value	p value	ES
RR	PRE	19.39 \pm 3.10	67	5.13	<0.001	0.53
	POST	16.99 \pm 3.25	67			
PR	PRE	80.04 \pm 9.86	67	3.02	.004	0.35
	POST	76.18 \pm 9.61	67			
SBP	PRE	129.01 \pm 12.20	67	1.73	.089	0.21
	POST	126.24 \pm 13.94	67			
DBP	PRE	79.94 \pm 8.97	67	1.75	.085	0.21
	POST	78.24 \pm 8.48	67			
WT	PRE	68.25 \pm 14.23	64	3.10	.003	0.36
	POST	67.39 \pm 13.85	64			
BHT	PRE	12.90 \pm 5.89	67	-6.31	<0.001	0.61
	POST	15.36 \pm 6.41	67			
MS	PRE	3.90 \pm 2.98	67	2.86	.006	0.33
	POST	3.49 \pm 2.69	67			
SS	PRE	5.09 \pm 3.49	67	9.42	<0.001	0.76
	POST	1.76 \pm 1.96	67			
FBS	PRE	138.60 \pm 60.25	47	2.83	.007	0.38
	POST	117.04 \pm 38.66	47			
PPBS	PRE	218.28 \pm 83.98	46	3.17	.003	0.43
	POST	187.35 \pm 70.26	46			

Table 13a Caption: Pre-post changes over a 7day IAYT program for secondary outcome variables. The program improved all variables. Only systolic and diastolic blood pressure (SBP, DBP) did not change significantly $p>0.05$.

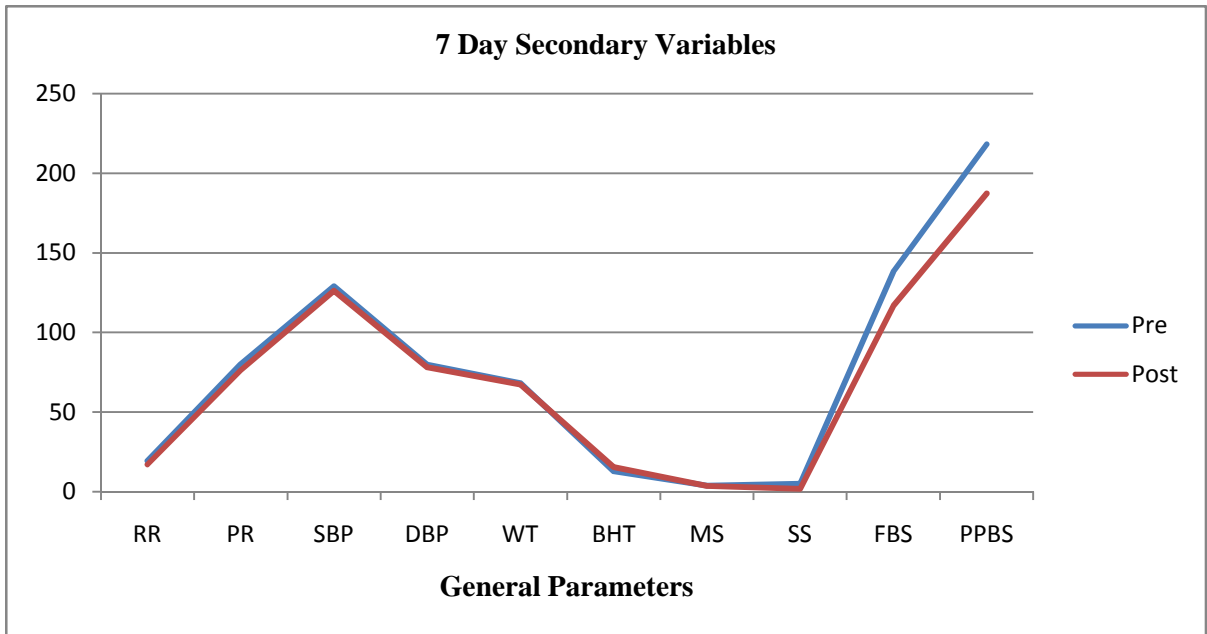


Fig 15: Pre post Comparison of Means of secondary variables after 7 days from Table 13a

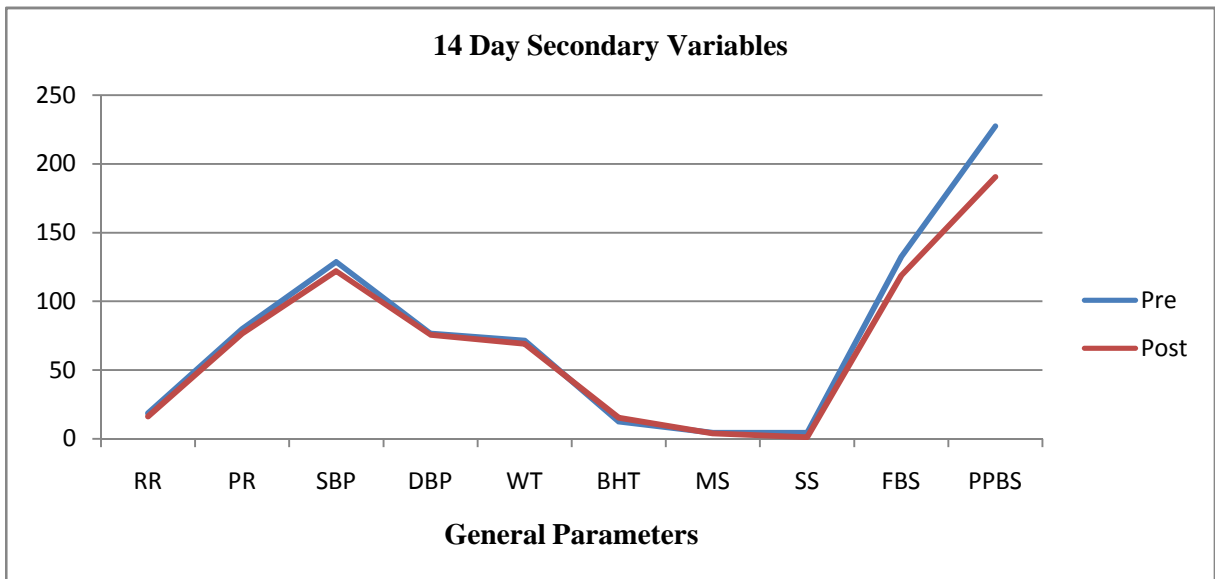


Fig 16: Pre post Comparison of Means of secondary variables after 14 day from Table 13b

TABLE 13b
Secondary Variables for 14 Day Participants

Variable		Mean \pm SD	N	't' Value	p Value	ES
RR	PRE	18.58 \pm 3.30	62	4.21	<0.001	0.47
	POST	16.24 \pm 3.34				
PR	PRE	79.69 \pm 8.87	62	2.64	.011	0.32
	POST	76.60 \pm 8.28				
SBP	PRE	128.66 \pm 15.98	61	4.09	<0.001	0.47
	POST	121.84 \pm 9.12				
DBP	PRE	76.52 \pm 9.78	61	.79	.433	0.10
	POST	75.59 \pm 8.11				
WT	PRE	71.27 \pm 15.64	61	2.53	.014	0.31
	POST	69.04 \pm 13.88				
BHT	PRE	12.55 \pm 9.90	62	-2.29	.025	0.28
	POST	15.40 \pm 5.13				
MS	PRE	4.29 \pm 2.73	62	3.02	.004	0.36
	POST	3.97 \pm 2.45				
SS	PRE	4.33 \pm 3.38	61	8.14	<0.001	0.72
	POST	1.20 \pm 1.54				
FBS	PRE	132.47 \pm 43.55	51	2.03	.048	0.28
	POST	118.74 \pm 41.06				
PPBS	PRE	227.38 \pm 85.24	50	3.15	.003	0.41
	POST	190.35 \pm 77.53				

Table 13b Caption: Pre-post changes in secondary outcome variables over a 14 day IAYT program. All variables improved except Diastolic blood pressure (DBP).

7.6 PRE-POST ACUGRAPH3 ASSESSMENT OF SMET FOR MANGERS

Results are given in **Table 14a**. In the pre-data, mean energy level was very low, 24.38 \pm 8.24, but much of the variance was due to upper-lower imbalance of 22.62 \pm 14.30. The average for the upper meridians was 26.0 \pm 11.24, while that for the lower meridians was 23.51 \pm 12.35. This shows that the executives' normal energy levels were very low.

Comparing the pre data with the post data showed general improvements in overall meridian energy values. Only two meridians did not improve significantly on average, KI_L ($p= 0.277$) and HT_L ($p= 0.090$), though the latter showed a good trend. All other meridians improved in energy with $p < 0.05$, confirming previous findings that low pranic energy levels are rectified by IAYT Yoga lifestyle intervention (Niharika Nagilla et al., 2013; Sharma, Hankey, Meenakshy, et al., 2014; Singh, 2009b) With regard to the average variables, overall energy level EL improved, as did its components of Yin meridian mean energy, and Yang meridian mean energy.

A striking feature of these results is the extremely low average energy level of 24.38, EL. The same operator previously obtained a mean energy level of 86.05 for a group of 37 diabetics (Sharma, Hankey, Nagendra, et al., 2014) normally, pathology tends to decrease EL values, but here, despite being apparently healthy, subjects had overall energy levels only 28% of the diabetic patients. The operator (MKB) also reported that, when taking the pre-data, the low energy levels made many readings hard to obtain; even achieving initial electrical contact at an acupoints presented a challenge. The low EL value presented a contrast, however, to the number of balanced meridians: The subjects had an average of 10.96 out of 12 meridians in balance in the pre data, remaining much the same at 10.71 in the post data. In contrast, the group of diabetics averaged many more meridians out of balance. So in balance / out of balance appears to be a more reliable estimate of pathology, as stated in the AcuGraph manual.

TABLE 14a
5-Day SMET Program: Upper Meridians

Meridian		Mean \pm SD	Change	't' Value	p Value
LU_L	PRE	30.04 \pm 12.70	8.22	3.33	0.0018
	POST	38.27 \pm 19.12			
LU_R	PRE	25.29 \pm 11.05	9.2	3.91	0.0003
	POST	34.49 \pm 18.03			
PC_L	PRE	28.00 \pm 10.76	7.78	3.71	0.0006
	POST	35.78 \pm 14.03			
PC_R	PRE	23.42 \pm 10.15	8.13	4.31	0.0001
	POST	31.56 \pm 11.12			
HT_L	PRE	27.42 \pm 15.81	4.4	1.73	0.09
	POST	31.82 \pm 16.52			
HT_R	PRE	20.89 \pm 8.54	8.36	5.74	8×10^{-7}
	POST	29.24 \pm 11.61			
SI_L	PRE	26.40 \pm 12.65	6.04	2.69	0.010
	POST	32.44 \pm 16.60			
SI_R	PRE	26.00 \pm 10.26	6.53	3.23	0.0023
	POST	32.53 \pm 14.02			
TE_L	PRE	24.76 \pm 12.91	5.69	2.99	0.0046
	POST	30.44 \pm 13.29			
TE_R	PRE	22.58 \pm 8.67	6.76	3.74	0.0005
	POST	29.33 \pm 14.66			
LI_L	PRE	30.27 \pm 10.69	8.8	3.03	0.0040
	POST	39.07 \pm 18.52			
LI_R	PRE	26.93 \pm 10.71	7.91	3.47	0.0012
	POST	34.84 \pm 16.18			

Table 14a Caption: Pre-post changes in Acugraph parameters for Upper Meridians over a 5 day SMET program. Significant differences, $p < 0.05$, were observed in all meridians after the intervention.

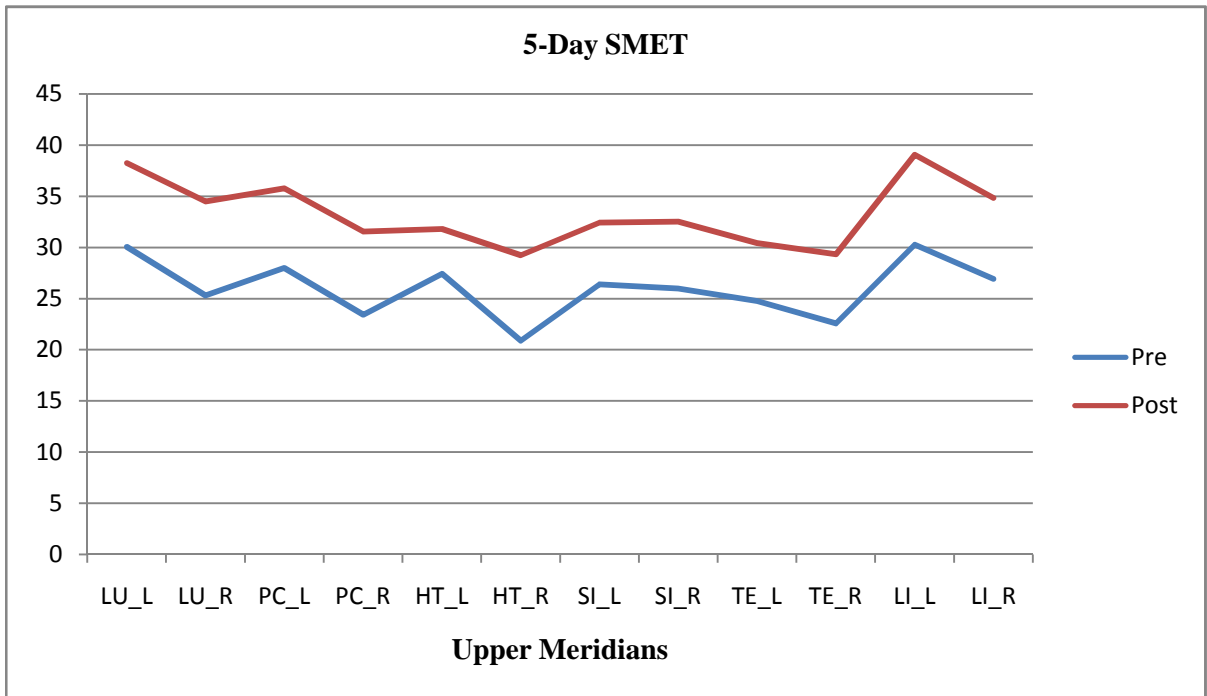


Fig 17: Pre post Comparison of Means of upper meridians after 5 days SMET from Table 14a

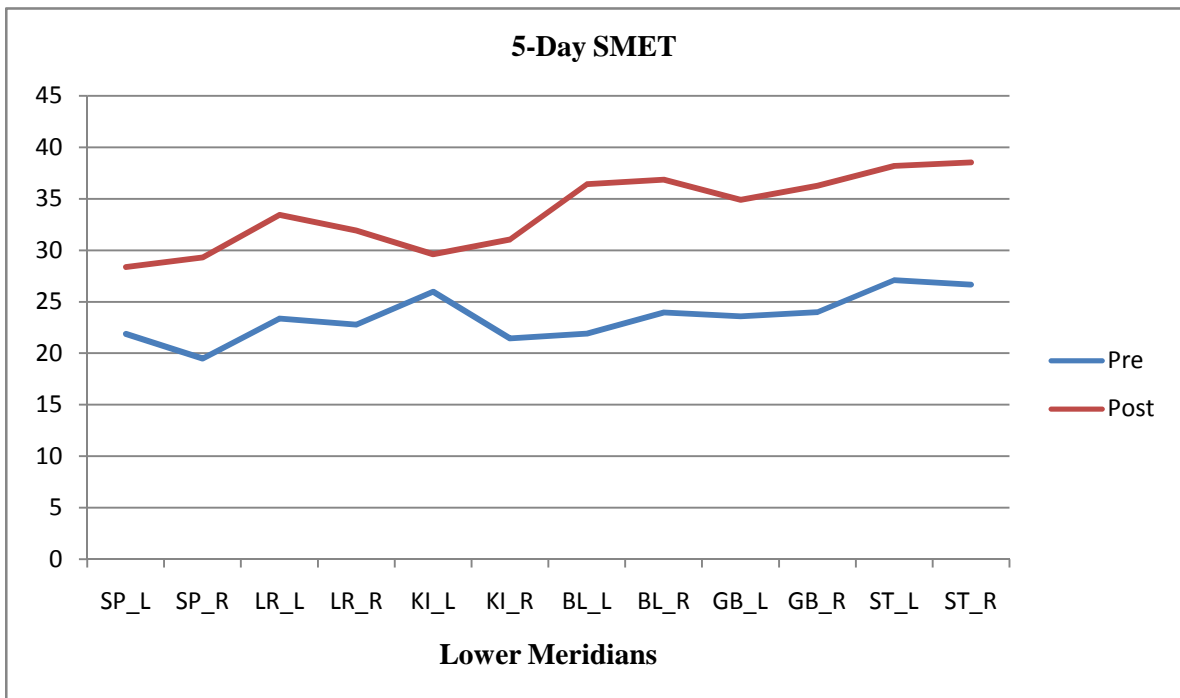


Fig 18: Pre post Comparison of Means of lower meridians after 5 days SMET from Table 14b

TABLE 14b
5-Day SMET Program: Lower Meridians

Meridian		Mean \pm SD	Change	't'	p Value
SP_L	PRE	21.87 \pm 11.85	6.49	3.95	0.00027
	POST	28.36 \pm 11.97			
SP_R	PRE	19.47 \pm 9.66	10	4.98	0.00001
	POST	29.29 \pm 16.37			
LR_L	PRE	23.38 \pm 11.10	10.04	5.2	4 x 10 ⁻⁷
	POST	33.42 \pm 15.43			
LR_R	PRE	22.76 \pm 13.08	9.16	4.5	0.00005
	POST	31.91 \pm 17.67			
KI_L	PRE	26.00 \pm 19.78	3.6	1.1	0.277
	POST	29.60 \pm 16.74			
KI_R	PRE	21.42 \pm 10.15	10	4.21	0.00012
	POST	31.02 \pm 17.54			
BL_L	PRE	21.91 \pm 10.14	14.49	5.35	0.000003
	POST	36.40 \pm 20.60			
BL_R	PRE	23.96 \pm 11.67	12.89	5.47	0.000002
	POST	36.84 \pm 20.04			
GB_L	PRE	23.60 \pm 11.27	11.29	4.36	0.000077
	POST	34.89 \pm 21.01			
GB_R	PRE	24.00 \pm 10.55	12.27	4.67	0.000028
	POST	36.27 \pm 21.89			
ST_L	PRE	27.11 \pm 15.15	11.07	3.95	0.00028
	POST	38.18 \pm 21.85			
ST_R	PRE	26.67 \pm 13.76	11.87	5.08	0.000007
	POST	38.53 \pm 21.13			

Table 14b Caption: Pre-post changes in Acugraph parameters for Lower Meridians over a 5 day SMET program. All meridians improved after the intervention, pre-post differences being significant, $p < 0.05$, in all meridians, except KI_L.

TABLE 14c
Group Meridian Averages

Meridian		Mean \pm SD	Change	't'	p Value
LOW	PRE	10.67 \pm 7.71	+8.00	5.46	0.0000020
	POST	18.67 \pm 12.18			
MEDIUM	PRE	24.96 \pm 8.36	+8.15	5.47	0.0000020
	POST	33.11 \pm 12.63			
HIGH	PRE	38.71 \pm 9.69	+9.29	4.99	0.000010
	POST	48.00 \pm 12.62			
YIN	PRE	24.29 \pm 8.24	+7.8	5.44	0.0000020
	POST	32.09 \pm 11.48			
YANG	PRE	25.73 \pm 8.81	+9.29	5.55	0.0000015
	POST	35.02 \pm 14.30			
PIE	PRE	77.93 \pm 8.85	-3.46	1.71	0.095
	POST	74.47 \pm 11.16			
EL	PRE	24.38 \pm 8.24	+8.62	5.59	0.0000013
	POST	33.00 \pm 12.62			
ES	PRE	86.24 \pm 8.61	-2.68	1.55	0.127
	POST	83.56 \pm 7.87			
U_L_BAL	PRE	22.62 \pm 14.30	+0.45	0.19	0.852
	POST	23.07 \pm 16.33			
L_R_BAL	PRE	10.80 \pm 8.85	-0.64	0.36	0.720
	POST	10.16 \pm 6.91			
YIN/YANG	PRE	10.53 \pm 9.65	-0.86	0.52	0.603
	POST	9.67 \pm 7.40			

Table 14c Caption: Pre-post changes in Acugraph parameters over a 5 day SMET program. The program significantly improved overall chi energy, but the data shows exceptionally low readings. Most pre readings are below 30, one below 20. Other studies have found low energy levels in people working in stressful jobs, as here. Personal Integrated Energy (PIE), Chi energy stability (CES), Upper Lower Balance (ULB), Left Right Balance (LRB), Yin/Yang Balance did not change significantly.

CHAPTER – 8

DISCUSSION

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8.0 DISCUSSION

8.1 CONSIDERATIONS OF THE FOUR EXPERIMENTS

The four experimental protocols yielded interesting datasets, all of which contained many results with important implications for yoga treatments of the groups involved. The two without intervention can only be analyzed as baseline comparisons – they are cross-sectional studies. The other two can be analyzed as both cross-sectional and interventional studies. These six analyses are presented in the six sections that follow, with a short discussion of their over implications in section 8.2. It is significant that AcuGraph study of groups is able to yield definitive results, when the machine cannot do so accurately enough on individual patients for the results to be reliable and significant. The analysis of *group* data effectively reduces the machine's very high coefficients of variance (Mist et al, 2012) to tolerable levels, permitting statistically acceptable results to be obtained. This justifies the machine's retention in the institution.

8.2 BASELINE COMPARISON OF TYPE 2 DM AND NORMAL HEALTHY ON ACUGRAPH

The aim was to determine normative values for Type2 DM patients compared to a normal healthy group. Results show that, for Type2DM patients, mean and range were at lower values in all lower meridians $p < 0.001$. Sharma et al's (Sharma, Hankey, Meenakshy, et al., 2014) earlier study also found that diabetics have large upper-lower (U_L) imbalances, and Left-Right imbalance in the upper meridians, both of which our data confirms. Our Pre-Post data indicates that Yoga therapy can restore U_L balance, but this needs further confirmation. An interesting question is how these relate to autonomic

imbalances? As upper-lower imbalance seems stress-related, can bringing upper and lower meridians into balance, also restore autonomic balance?

8.3 BASELINE COMPARISON OF MANAGERS AND NORMAL HEALTHY ON ACUGRAPH

Our results showed that skin conductances are significantly lower in all 24 meridians for the managers – all p values <0.001. This finding needs careful interpretation: does it imply that strain on managers is significantly greater as a result of their professional work, or is the finding more related to their diet or life-styles. While the SMET intervention did raise their meridian values significantly, it appeared that greater rest was needed to restore them to anywhere near desirable, normal values. Since the health of executives is vital to the nation's prosperity, it is important that this question is investigated carefully in future research.

8.4 BASELINE COMPARISON OF HIV INFECTED CHILDREN AND NON-INFECTED CHILDREN ON ACUGRAPH

Results show clearly that electrodermal conductance at the Jing-Well acupuncture points is lower in HIV infected children than in normal children, as the study hypothesis proposed. This is not in itself surprising. The ongoing challenge presented by the presence of a chronic infection, as well as the effect of a weakened immune system, would be expected to deplete levels of chi, the internal sense of vitality associated with optimized levels of electrodermal conductance, and thus to lower AcuGraph measurements. Results are therefore consistent with HIV infected children having lower

levels of chi, and this being the reason for lowered sense of well-being and Quality of Life.

Previous studies have consistently shown that the effect of Yoga programs is first to improve levels of electrodermal skin conductance at acupuncture points, conventionally interpreted as improving levels of chi energy in the associated acupuncture meridians, and second to improve levels of balance between different regions of the body and between different meridians. Such effects have been seen in participants in qigong training courses (Sancier, 2004) in normal, healthy students coming for one month Yoga training courses (Nagilla et al., 2013), particularly when compared to those with six months or more experience (Sharma, Hankey, Nagilla, Meenakshy, & Nagendra, 2014) , and also in executives coming for five day SMET training courses (Meenakshy et al., 2014). Interesting secondary effects have also been seen, such as indications of improved regulation and restoration of depleted energy levels of ladies relative to men (Sharma, Hankey, Nagilla, et al., 2014). These studies suggest that Yoga practice should, to some extent, increase levels of chi depleted in HIV positive children. Implications are that, by virtue of its power to restore chi levels, Yoga practice may help increase sense of well-being in HIV infected children, and materially contribute to their quality of life.

8.5 BASELINE COMPARISON OF DEPRESSION AND HEALTHY SUBJECTS ON ACUGRAPH

The results of the measurements on depression patients may at first seem surprising. One unexpected finding was normal levels of group mean conductance for the depression group, since values near 100 are considered a sign of robust physical health. The lower

values for the supposedly healthy control group were less surprising. Participants arriving at the Yoga therapy center often present with low mean conductance levels. One to two weeks Yoga therapy usually improves them greatly. One possible reason for generally observed low mean readings is lack of care over physical health, including poor personal lifestyle, which Yoga lifestyle programs are designed to improve. The meridians with lowest values for both groups, kidney (KI) and bladder (BL), offer valuable topics for further study e.g. the relationship between their values, fluid intake, and overall health.

A second possibly surprising result is the strong influence of depression on conductances. Each meridian is connected to one of the body's principle organs, so a mental pathology like depression might not be expected to influence acupuncture point conductance values. The observed influence may be understood as follows: both TCM and Yoga maintain that states of mind influence levels of *Qi* (or *Prāṇa*). Those with disturbed states of mind, i.e. depression, may therefore be expected to have meridian conductance levels disturbed.

As an ancient system of medicine and health care, Traditional Chinese Medicine is one of the oldest, continually practiced, codified systems of medicine in the world (Veith, 2002). It is based on the concept of maintaining balance of the vital energy, or *Qi*, that flows in specific channels, or meridians throughout the body. Diagnosis often incorporates assessment of levels of *Qi* at various points where a meridian touches the surface (acupuncture points). Chinese medicine includes Chinese herbal medicine, and means of stimulating and altering *Qi* levels in each meridian such as acupuncture, acupressure (Tui Na), and moxibustion, also massage therapy and other subtle techniques such as Qigong meditation and Tai Chi (Veith, 2002).

Classically, acupuncture and moxibustion were used to treat the vast majority of complaints, including acute conditions like rheumatism, gout and neuralgic conditions, abdominal cramps and colic. They were also recommended in cases of mental disturbance. TCM recognizes that mental disorders are the outcome of poor or inactive energy, or an imbalance between yin and yang (Veith, 1973).

In developed countries Integrative Medicine has become increasingly popular, usually combining conventional medicine with TCM, including acupuncture and Chinese herbal medicine, because integrative practice of these disciplines is well advanced in China. Accurate use of TCM requires traditional assessment through the Chinese system of pulse analysis, which is challenging and often difficult for western practitioners to learn, requiring, as it does, great sensitivity on the part of the diagnostician. Electrodermal assessment being mechanical is relatively easier to learn.

Electrodermal study of groups reveals aspects of patients' conditions that could not have been inferred without analysis of group data. For example, there are sufficient variations in both machine readings, and patient physiologies to preclude the possibility of making some general inference from readings from individuals, or small numbers of individuals. The series of analyses of group data reported here (Meenakshy et al., 2013; Sharma, Hankey, Meenakshy, et al., 2014), characterizing patients' meridian properties, develop an approach to analyzing individual pathologies not undertaken previously due to professional concern for individual measurements. Big differences were established between the group of depression patients and those with no overt pathology. Some, like the greater values for AcuGraph imbalance variables, PIE, E_S, U_L, L_R, and Y_Y,

were expected, while the much larger standard deviations for Group Means of individual meridians had not been hypothesized, but is consistent with previous findings (Nagilla, Hankey, Nagendra 2013), where unanticipated reductions in group standard deviations were observed following yoga practice. The other major difference, higher group mean conductances for all meridians, had not been anticipated either. The statistical significances are tiny enough, and effect sizes large enough, to make this new observation definite.

Tables 8b and 9 continue this investigation of high variabilities for individual patients, yielding the significant result: the size of standard deviation in meridian conductance values is much higher for individual depression patients than for no pathology controls. This finding has significant practical and theoretical implications: practically, it implies increased disease susceptibility for depression patients. Acugraph readings of healthy organs are meant to remain within a fixed range of the mean. High individual variances (Table 9) mean that depression patients have several organs outside this range and are in greater danger of falling ill. High values of group standard deviations (Table 11a and 12a) have similar implications.

Now consider the possible cause: Variances increase when regulation and control are less precise. Higher individual and group standard deviations suggest that top-down regulation of meridian energies is compromised. This follows if stress levels are higher, as holds for depression. Results are consistent with the idea that stress is a precondition for most disease – its psychosomatic component. Acugraph readings on depression

patients, and other groups with high values of group variance, therefore seem to be a simple way to confirm this fundamental idea in mind-body medicine.

Analysis of conductances therefore agrees with identification of stress as an important factor in etiology. If depression is a manifestation of stress, then as a group, depression patients must be in greater danger of physical illness. The data analysis presented here confirms that conclusion from a completely new, self-consistent perspective. It also points to variability of meridian energies as a factor to consider in understanding individual health (Nagilla et al., 2013; Sharma, Hankey, Nagilla, et al., 2014).

Indian tradition maintains that regular practice of Yoga and associated techniques like meditation improves overall health (Nagarathna, 2001). For example, the Transcendental Meditation technique (Yogi, 2001) has been shown to steadily decrease health costs of those who learn (Herron, Hillis, Mandarino, Orme-Johnson, & Walton, 1996), so that regular meditators' hospitalization costs are some 50% lower than those of a non-practicing control group (Orme-Johnson, 1987). Data presented here and in other studies (Nagilla et al., 2013; Sharma, Hankey, Nagilla, et al., 2014) point to two possible mechanisms for this: increases in Qi energy as measured by conductance values, and variance reduction with its implication of better variable control. Improved regulation should, in general, improve health (Hankey, 2012b). If Yoga practice improves physiological control of meridian energies (Niharika Nagilla et al., 2013; Sharma, Hankey, Nagilla, et al., 2014) i.e. regulation, that should contribute to its generally recognized ability to improve health (Nagendra, 2004).

The studies' strengths include the very definite nature of the results (1) Their statistical significance, with consistent, higher values of Groups Averages for individual meridian energy levels and SDs, and measures of imbalances for the Depression group; (2) the confirmed expectations of levels of imbalance, and (3) their extension of observations of large SDs from previous studies (Nagilla et al., 2013; Sharma, Hankey, Nagilla, et al., 2014).

The limitations of the study include the relatively small number of participants (27 Depression, 43 Healthy), and its relatively limited choice of populations. The extent to which it may generalize to other populations may be questioned. Being a cross-sectional study is another limitation, though the statistics offset this.

The future of this kind of research is to extend AcuGraph classifications to further kinds of pathology and to larger groups from more varied populations. AcuGraph measures of depression patients should also be studied in a specialist mental health institution, where processes of recovery of both in- and out-patients can be followed.

In both mental health and other pathologies, it should be possible to test hypotheses about how Yoga brings about cure of otherwise chronic pathologies. For example, previous studies have shown that regular Yoga practice improves meridian stability, suggesting how Yoga may benefit patients with mental disturbance, and fitting the picture that restoration of good regulation restores health (Hankey, 2012a; Hankey, 2012b). Yoga practice may thus have the side benefit of preventing physical disease in depression patients, whereas merely relieving symptoms by administering anti-depressants will fail to do so. This implication is worth further research.

8.6 PRE-POST ACUGRAPH ASSESSMENT AFTER 7 & 14 DAYS YOGA INTERVENTION FOR TYPE 2 DM

Results strongly suggest that increases in the upper meridians are definite, but larger numbers of subjects are required for changes in individual meridians to reach significance. Initial Upper-Lower imbalance, with upper meridians showing higher conductance levels, scope for increase in upper meridian conductance is reduced. Despite significant electrodermal conductance changes at Jing-Well acupuncture points, seven days changes were more significant than fourteen day changes. Could this be because participants become bored repeating the same practices for more than seven days? The study hypothesis had been that increased intervention duration would bring greater improvement in blood sugar levels; however, changes observed after fourteen days did not do so. Furthermore, lack of improvements in the heart (HT) meridians strongly indicates the possibility of heart complication in T2DM patients – as is well known from associations with Metabolic Syndrome disorders. Sharma et al's (Sharma, Hankey, Meenakshy, et al., 2014) earlier study indicated that diabetics have large upper-lower (U_L) imbalances. Our study indicates that U_L balance can be restored by Yoga therapy practice, but this needs further confirmation, as may the possibility that autonomic balance may also result from bringing upper and lower meridians into balance.

This strongly suggests that increases in all upper meridians are definite, but need larger numbers of subjects to reach significance for individual meridians. Due to Upper-Lower imbalances, with the upper meridians having higher conductance, there is less scope for improvement in upper meridian conductance.

Further anomalies were observed in the measures of correlations between the primary variables (acupuncture meridian Jing-Well endpoint conductances), and the secondary variables (medical parameters, including symptom and medication scores), given in Tables 13a-3b. Though there was no particular reason to consider the two groups any different based on initial values of their demographic variables, the correlations obtained between the variable sets were totally different.

8.7 PRE-POST ACUGRAPH ASSESSMENT OF SMET FOR MANAGERS

Low energy levels indicate strain, and suggest the kind of susceptibility to disease, from which busy executives are known to suffer – pressurized work environments make employees disease prone. The Managers study tends to corroborate that idea. In terms of *prāṇic* energy, one would say that the *prāṇa* levels were low and that the *prāṇamayakosha* lacked resilience i.e. resistance to disease was compromised.

Despite low initial energy levels, the data upheld the experimental hypothesis that five days SMET program would increase energy levels. Average increase was 8.77 ± 2.72 points, and post readings were correspondingly easier to obtain. At the end of the course, however, ‘Energy Levels’ in most participants were still far lower than is desirable, suggesting that a longer intervention is needed for modern executives. The uniform increases observed over a range of initial values support this idea. Longer interventions might also show significant changes in the various combination variables that did not reach significance.

Similar studies have obtained related results: measures of Chinese practices also indicate increased chi energy (Sancier, 1994; Sancier, 2003) found increased levels of Chi

following a weekend Qigong workshop. Another study of Tai Chi (Jin, 1992) showed greater reduction in salivary cortisol and improvement in mood than meditation and brisk walking. Tai Chi involves slow body movements providing moderate aerobic exercise, but does not involve supine rest alternated with slow body movements as does cyclic meditation used in SMET.

The natural question is how Yoga achieves the increases observed. One hypothesis is that it does so directly, because Yoga practices aim to increase levels of *prānic* energy (Nagilla et al., 2013) i.e. chi in the meridians. However, it could also be because energy consumption tends to be decreased by Yoga practices, and practitioners' physiology tends to function more economically, and should have 'energy' to spare. This seems to happen during Tai Chi practice: oxygen consumption reduces when subjects breathe thru an open circuit apparatus (Lan, Chen, Lai, & Wong, 2001).

Similarly, a yoga study has reported reduction in oxygen consumption (25.2%), and sympathetic activity after 10 minute practice of yoga-based guided relaxation in a supine posture (Vempati & Telles, 2002) Studies of Transcendental Meditation (TM) reported reductions in metabolic rate (and hence need for oxygen) reflected by involuntary decreases in respiration rate and volume (Wallace, Benson, & Wilson, 1971). Greater reductions in oxygen consumption, respiratory rate, minute ventilation and tidal volume after cyclic meditation (Telles, Reddy, & Nagendra, 2000) have similar explanations. They suggest that slow practice of yoga postures followed by supine rest induces deeper relaxation than supine rest alone. The importance of alternating exercise with periods of rest has been independently described (Falk, 1995). The yoga postures practiced in CM

are physically activating compared to supine rest. An electromyographic study of guided relaxation combined with meditative stretching (body-mind training) found 31% reduction in frontalis muscle activation and 22% reduction in state anxiety and fatigue (Engel & Andersen, 2000) suggesting that this intervention induces deeper muscular relaxation. Related studies showed that cyclic meditation improves performance on the six letter cancellation test better than supine rest (Sarang & Telles, 2007; Subramanya & Telles, 2009). This may be due to ‘calming’ and ‘stimulating’ effects produced by slow body movements with emphasis on sustained attention and awareness. A study of the effects of relaxation, visualization and yoga training, three different procedures, on perception of physical and mental energy and mood, demonstrated that relaxation and visualization made subjects sleepy and sluggish immediately after the practice, whereas yoga practices consisting of stretch and breathing produced significantly greater increase in perception of mental and physical energy, and feelings of alertness and enthusiasm (Wood, 1993).

8.8 OVERALL ASSESSMENT

Obtaining significant results on all six datasets means that AcuGraph can make good, significant measurements on groups and, as in the case of Type 2 Diabetes Mellitus patients, reliably assess the acupuncture meridian characteristics of a specific pathology. Equally, it can identify differences between results of different kinds of intervention, and can therefore be used to help design Yoga treatments to achieve particular goals in terms of restoration of acupuncture meridian energies to ideal values representing health.

The assessment of managers was particularly relevant in this regard. Executives in large corporations are well known to work under considerable pressure, which naturally

depletes levels of pranic energy. The general detection of this by AcuGraph means that new medical recommendations can be made for managers' preventive health programs, so that they can maintain improved levels of health, and work days lost due to ill-health are reduced.

Of particular diagnostic and etiological interest was the observation of Upper-Lower imbalances in meridian energies in all groups, suggesting that this imbalance is prevalent throughout the population. It is quite possible that this imbalance correlates with a fundamental imbalance in *Prāṇa-vata* in Ayurveda. Since it is usually Vata dosha that drives the other doshas out of balance, an imbalance of this kind would be exactly the kind of key step in the progression of disease development that health officials would want to eradicate in order for the overall health of the population to be significantly improved. One could institute a national or state health policy of identifying those with this imbalance and then using the data as the basis for individual remedial programs to prevent their condition worsening to manifest levels of pathology. For example, three as yet unpublished observational studies of participants in S-VYASA programs have shown valuable reductions in Upper-Lower imbalance: Yoga programs involving more vigorous activity for obese patients; attending and participating in the performance of Vedic Yajnas; and walking on the Acupressure track – all three normalize Upper-Lower imbalance.

Practices which reduce these kinds of imbalance may well be able to reduce health complications of diseases such as T2DM, and other stress-related psychosomatic disorders, including depression, anxiety, and even susceptibility to infectious diseases.

For example, tendencies towards diabetic nephropathy cannot be predicted from FBS, PPBS, and HbA1c levels alone, and must therefore depend more particularly on other factors in the overall etiology. Upper-Lower imbalance, being a key measure of reduction of pranic energy (chi) to the kidneys, then becomes a promising possible candidate to investigate, regarding its role as a significant etiological factor in nephrology. This could be a primary pathology or a secondary complication of other primary pathologies like diabetes.

Clearly the use of AcuGraph in India should not be limited to Yoga medicine, but could be integrated generally as a useful tool into the practice of any system of medicine willing to make use of its insights into the subtle energy imbalances of a patient. While all AYUSH systems may find this useful, it is clear that Yoga and TCM, which directly incorporate understanding of *Prāṇa*/qi into their theory, will be better placed to make use of it. That is no reason why another system should not do the same. Subtle energy assessments, as with AcuGraph, therefore have an important, natural role to play in any system of integrative medicine.

CHAPTER –9

APPRAISAL

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9.0 APPRAISAL

9.1 SUMMARY

These Acugraph studies suggest that, despite its high Coefficient of Variance, electrodermal conductivity of humans at Jing-Well acupuncture meridian endpoints can be used for several purposes: (1) to evaluate differences between various populations; (2) to identify characteristics of specific pathologies; and (3) to evaluate changes brought about by Yoga practice. It shows that Yoga interventions and stress management programs are usually very effective, and indicates how different aspects of the health of the main organs and organ systems, indicated by the 12 meridians, can be improved in different populations by specific CAM modalities.

1. Comparison of Type 2 DM with Normal healthy controls: the sign test showed that all the lower meridians had lower readings than the controls.
2. The Managers had lower readings than normal healthy subjects.
3. HIV positive group: the sign test indicated that we can reasonably state that *all* meridians in the HIV children showed lower readings than normal children, despite t tests on two meridians not reaching significance.
4. Depression Patients: Higher variance may indicate poor regulation at physical and mental levels. Hence states of improved health, possibly leading to optimal health, can be inferred from low variation in Acugraph measurements. Distinct change in means between the two groups confirms AcuGraph's ability to distinguish different populations.

5. The T2DM group showed improvement in primary outcome variables (Acugraph meridian readings), particularly overall chi energy level (E_L) after yoga therapy. Changes in lower meridians and improvements in Upper / Lower imbalance had been observed in an earlier study conducted to identify T2DM meridian characteristics (B Sharma, Hankey, Meenakshy, et al., 2014).
6. SMET Stress management program: pre-post data comparison showed general improvements in overall meridian energy values after five days SMET. Only two meridians did not improve significantly, which might have been due to the short duration of the course i.e. some meridians may improve Acugraph values more slowly.

9.2 CONCLUSION

Acugraph measurements suggest that even short Yoga interventions influence the health of physiological systems; which systems depending on the Yoga intervention selected. For example we were able to identify interventions helping lower meridians, more prone to deteriorate in Type 2 Diabetes patients. Certain Yoga therapy programs can improve balance between chi energy levels in upper and lower regions of the body. HIV children showed lower readings than normal children in all meridians, indicating greater proneness to disease. General improvements in overall meridian energy values were apparent after the SMET stress management program. Observed higher variances in depression patients probably indicate poor regulation at physical and mental levels, which should greatly improve with Yoga practice.

9.3 STRENGTH OF THE STUDY

1. The four studies demonstrated the ability of AcuGraph measurements of skin conductance at Jing-Well meridian endpoints in various populations, to evaluate changes following Yoga therapy, and also changes in Group means between different populations.
2. The four studies also bring out the value of Yoga practice in improving acumeridian energy levels, and bringing balance between energies in different meridians. Acugraph results were in sufficient agreement to establish the instrument's value for groups.
3. As AcuGraph studies accumulate, the data can be used to construct a database for Public Health purposes: to evaluate the health of various sections of the population; to develop more reliable scientific criteria for diagnosis of specific pathologies, and/ optimize therapies for them.

9.4 LIMITATIONS OF THE STUDY

All the data from the diabetes group were taken on volunteers who came to a residential yoga treatment center *rogyadh ma*. Data on control groups were collected either from S-VYASA Yoga University's residential campus outside Bangalore, India, or its City Office / Yoga Center in the city itself. Therefore, most study participants came from the southern part of India, particularly Bangalore. This restriction of study populations may produce limitations in the interpretation and generalization of results. Also interventions are whole Yoga Life-style interventions, and the study design makes no attempt to evaluate effects of specific Yoga practices.

At S-VYASA, two instruments have been used to look for changes in subtle energies corresponding to the *Prāṇamaya Kośa*: AcuGraph and GDV. While definite trends have been seen, more extensive investigations are needed to understand definitively what is going on, and to establish the usefulness and validity of the instruments for the general Indian population.

The absence of previous studies on which to base quantitative predictions means that these studies should be considered pilot studies. It also meant that the studies did not have the financial support to obtain data on some important variables requiring more expensive tests like HbA1c. The study's weaknesses are a reflection of these factors. As an example, sub-group analyses were not planned at the outset, so sample sizes appropriate for them were not obtained.

Similarly, the paucity of previous peer-reviewed literature makes it difficult to judge either the novelty or significance of these seemingly exciting new results. Specifically planned experiments are now required to demonstrate details about the phenomena revealed, and to answer various questions raised. For example, more costly biochemical tests should be performed: e.g. to obtain HbA1c and nephrological data from all subjects.

9.5 IMPLICATIONS OF THE STUDY

These four AcuGraph studies suggest many potential applications of AcuGraph measurements to evaluate Yoga interventions: for example, to evaluate their effects on all stages of chronic diseases like Type 2 Diabetes Mellitus, particularly as length of pathology increases. Future studies will be able to determine precise benefits of various different Yoga interventions on each stage of chronic disease.

9.6 CHALLENGES OF THE STUDY

Bio-impedance measurements at acupuncture points have become a common diagnostic tool in Traditional Chinese Medicine (TCM). Studies using such measures have corroborated the idea that meridian imbalance corresponds to pathology. Although Acugraph may in fact be a reliable instrument, its actual application poses various challenges, including different pressures applied by different operators, and variations with age, gender, time of the day etc. In recent years many acupuncturists have started to use AcuGraph-like instruments, but this may offer challenges to obtain meaningful readings owing to high levels of instrument coefficients of variance. Despite these problems, the four experimental studies have still been able to quantify energy levels in the *prāṇamaya kosha* subtle body, for various different pathologies.

9.7 HOPES FOR THE FUTURE: A PERSPECTIVE

Biochemical parameters are currently taken for T2DM screening, but in future bioelectrical parameters could be used, if markers can be found for them, and they can be accurately determined. However, in the specific case of AcuGraph, its reliability for individual measurements must be improved i.e. its variability reduced. Various ways of achieving this should be explored. Program of quantifying *prāṇa* may be challenging, since its basic existence still requires experimental proof in the minds of many scientists. Once that is done, however, proof of effects of CAM therapy in these terms, and demonstration of the relevance of mind-body energy relationships will be facilitated. Specific proposals we can make include the following.

1. Increase duration of intervention, particularly in the case of SMET for executives.
2. Standardize specific statistical analysis patterns for Acugraph and related bio-energy instruments.
3. Clearly define the operational meaning of *prāṇa* (chi) in these studies.
4. Possibly by adding further secondary parameters – laboratory and chemical analyses.
5. Try to reduce variations in AcuGraph readings at all levels.
6. Replication studies confirming findings should be conducted to strengthen the evidence obtained in these studies.
7. Randomized controlled trials should be designed and implemented to achieve this.
8. Investigation of neurobiological and pranic energy mechanisms requires suitable design.

Those presently concerned about Public health realize that Western biomedicine and traditional complementary and alternative medicine (TCAM) should be integrated to achieve the most comprehensive range of effective treatments. The first can be seen to operate at the micro level of cellular physiology, while Yoga, Ayurveda and Chinese medicine (acupuncture) work on the "holistic" macro level of the whole system. No single system can meet the requirements of every condition in every patient, sometimes one and sometimes the other will provide the most efficacious treatment. A maximally effective health care system requires that each patient receive the most appropriate treatment for their specific condition – an integrative approach is required as India is presently planning to implement.

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APPENDICES

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APPENDIX: 1

DEMOGRAPHIC SHEET AND CONSENT FORM
Swami Vivekananda Yoga Anusandhana Samsthana(SVYASA)
19, Ekanath Bhavan, Gavipuram Circle, KG Nagar, Bengaluru – 19
Ph: (080) 2661 2669, (08110) 309 2900
Registration Form - BIO ENERGY EXAMINATION

Acu-Graph

GDV

1. **Name** : _____

2. **Date of Birth** : _____ **Age** : ____ **Gender** : **M / F**

3. **Education** : _____

4. **Occupation** : _____

5. **Marital status** **Married** **Unmarried**

6. **Religion** : _____

7. **Address** : _____

8. **Phone No** : _____

Email ID. : _____

9. **Diet** : **Vegetarian** **Non- vegetarian**

10. **Do you have earlier experience of yoga practice**
 No experience **0- 6 months** **6- 12 months**
 1- 3 years **3 – 5 years** **above 5 years**

11. **Regular physical activities**
 Exercise **Walking** **Sports** **Others** **None**

12. **Any major Ailments/Diseases:** _____

I give my consent to allow Acu-Graph/ GDV recording to be taken and use by the university, as they see fit. The university will take all the necessary steps to protect the data and the identity of the individual. It will only be released if requested by law/Government. The university will not be held responsible for any variation/error in reporting. The information given is considered correct at the time of release.

Note: 1. Data obtained through Acu-Graph or GDV as per wish and consent of the patient.
 2. The analysis or interpretation will not be viable for medical and legal purposes.

Date:

Place:






Signature: _____


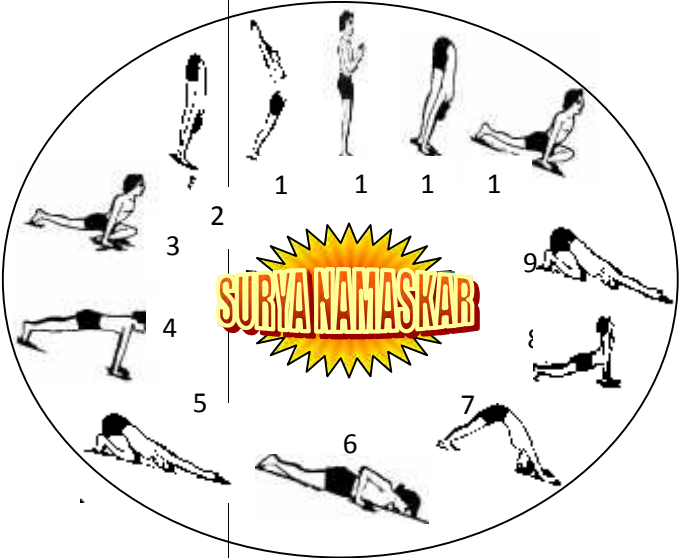



APPENDIX-2: Daily schedule of Yoga Group for Residential Program

S. No.	Time	Yoga group
1	05.00-5.30	Bath & wash
2	05.30-06.00 am	OM meditation - 30 minutes
3	06.00-07.00 am	Yoga based special technique - 60 minutes
4	07.15-08.00 am	Chanting of yogic hymns - – 45 minutes
5	08.00-09.00 am	Breakfast
6	09.00-10.00 am	Rest
7	10.00-11.00 am	Lecture (on yogic lifestyle) – 60 minutes
8	11.00-12.00 noon	Assessments and counseling
9	12.00-01.00 pm	<i>Prāṇāyama</i> (yogic breathing) – 60 minutes
10	01.00-02.00 pm	Lunch (vegetarian diet)
11	02.00-03.00 pm	Rest
12	03.00-03.45 pm	Cyclic meditation – 60 minutes
13	04.00-05.00 pm	Yoga based special technique - 60 minutes
14	05.00-06.15 pm	Tuning to Nature
15	06.15-07.00 pm	Divine hymns session (Bhajan) – 45 minutes
16	07.00-07.30 pm	M.S.R.T. (Mind Sound Resonance Technique) Meditation with yogic chants – 30 minutes
17	07.30-08.30 pm	Dinner (vegetarian diet)
18	08.30-09.00 pm	Trataka– 30 minutes
19	09.30	Lights off



APPENDIX-3 The Integrated Yoga Module as described below will be taught to all patients



Breathing Exercises: Rabbit breathing, Tiger breathing, Navasana breathing





Sithilikarana Vyayama (Loosening Exercises)		
1.	Jogging	
2.	Forward and backward bending	
3.	Trikonasana bending	
4.	Twisting	
5.	Dhanurasana Swing	






6.	Pavanamuktasana Kriya	
7.	Surya Namaskara	
8.	Quick Relaxation Technique (QRT)	
Asanas		
1.	Parivritta Trikonasana	
2.	Vakrasana / Ardha Matsyendrasana	


3.	Ustrasana.	
4.	Hamsasana/ Mayurasana	
5.	Bhujangasana	
6.	Chakrasana	
7.	Sarvangasana	
8.	Matsyasana	
9.	Deep Relaxation Technique (DRT)	
Bandhas		

1	Uddiyana Bandha	
2	Mula Bandha	

Kriyas		
1	Jala Neti.	
2	Sutra Neti.	

3	Vaman Dhouti.	
4	Shankha Prakshalana	
5	Agnisara Kriya	
6	Kapalabhati	
<p><i>Prāṇayama</i></p>		

<p>1.</p>	<p>Vibhaga <i>Prāṇayama</i>. (Sectional Breathing).</p>	
<p>2.</p>	<p>Surya Anuloma <i>Prāṇayama</i>.</p>	
<p>3.</p>	<p>Nadi Suddha <i>Prāṇayama</i>.</p>	
<p>4.</p>	<p>Sitali/Sitkari/Sadanta <i>Prāṇayama</i>.</p>	
<p>5.</p>	<p>Brahmari <i>Prāṇayama</i>.</p>	

Meditation (Dharana and Dhyana)		
1.	Nadanusandhana.	
2.	OM Meditation.	

APPENDIX: 4**ABBREVIATIONS****Primary outcome measure: AcuGraph Terminologies**

All major acupuncture meridians; 6 on each hand 6 on each foot, corresponding to the left and right meridians for the 12 major organs in the body:

ON HANDS

LU_L	Lung left
LU_R	Lung right
PC_L	Pericardium left
PC_R	Pericardium right
HT_L	Heart left
HT_R	Heart right
SI_L	Small Intestine left
SI_R	Small Intestine right
TE_L	Triple Warmer left
TE_R	Triple Warmer right
LI_L	Large Intestine left
LI_R	Large Intestine right

ON FEET

SP_L	Spleen left
SP_R	Spleen right
LR_L	Liver left
LR_R	Liver right
KI_L	Kidney left
KI_R	Kidney right
BL_L	Bladder left
BL_R	Bladder right
GB_L	Gall Bladder left
GB_R	Gall Bladder right
ST_L	Stomach left
ST_R	Stomach right

Group Meridian:

EL: Energy level (electrical conductivity of all meridians on an average)

ES: Energy Stability, determined by the values of the highest and lowest readings compared to the mean value of all meridian in the exam.

PIE: Personal Integrated Energy: related to the fraction of meridians in reasonable balance, neither high', nor low', nor split'.

Yin/Yang: Yin Yang Balance (tendency); Positive value and negative values are representative of Yang and Yin respectively.

U_L: Upper Lower balance (Balance between Jing-Well meridian points at hands and feet); Positive value and negative values are representative of upper and lower respectively.

L_R: Left Right balance (Balance between Jing-Well meridian points on left side and right side of the body); Positive value and negative values are representative of Right and Left respectively.

Secondary outcome measure

Fasting Blood Sugar	FBS
Post prantial Blood Sugar	PPBS
Respiratory rate	RR
Pulse rate	PR
Systolic Blood pleasure	SBP
Diastolic Blood pleasure	DBP
Bhramari	BHT
Medication Score	MS
Symptom Score	SS

APPENDIX 5

RAW DATA TABLES

PRE	AGE	GEN	LU_L	LU_R	PC_L	PC_R	HT_L	HT_R	SI_L	SI_R	TE_L	TE_R	LI_L	LI_R	SP_L	SP_R	LR_L	LR_R	KI_L	KI_R
X1	61	1	200	188	160	130	112	132	144	142	112	150	118	110	74	82	44	88	50	38
X2	46	1	20	28	28	18	16	14	18	14	14	24	20	24	12	8	8	12	6	12
X3	40	2	26	20	34	30	32	24	26	22	20	22	26	20	20	24	22	36	12	18
X4	74	1	32	46	68	16	54	16	16	18	28	16	44	32	16	22	18	8	6	8
X5	53	1	32	18	12	22	14	22	22	24	22	18	24	26	60	26	22	20	58	56
X6	56	1	40	36	42	32	30	40	30	28	56	28	40	30	14	12	14	12	18	16
X7	59	1	42	50	38	56	32	54	58	40	38	32	24	18	10	10	14	8	14	10
X8	51	1	46	56	48	48	54	40	48	40	40	36	48	44	50	26	28	18	20	26
X9	60	2	48	44	46	36	42	36	52	36	52	30	54	34	22	18	28	24	26	28
X10	49	2	48	40	40	28	34	42	36	34	34	42	38	38	40	44	38	48	54	40
X11	34	1	52	40	100	64	48	74	66	42	80	60	70	48	80	58	76	36	54	38
X12	58	1	54	28	52	38	34	38	38	36	30	28	42	34	36	28	46	42	34	34
X13	48	1	54	50	28	30	36	44	44	24	44	52	48	28	12	22	18	24	8	6
X14	56	2	56	58	54	22	34	44	36	44	32	46	46	30	16	14	14	6	10	6
X15	70	1	56	50	64	56	58	66	66	64	52	60	62	58	56	58	64	62	42	34
X16	72	1	58	42	46	40	46	30	68	40	66	44	42	52	34	36	36	54	26	40
X17	65	2	58	46	40	46	38	40	24	30	40	34	40	28	34	18	22	20	8	20
X18	70	2	60	46	70	70	70	72	80	74	74	48	66	66	16	34	28	42	76	58
X19	61	1	60	52	54	48	46	46	44	62	38	38	70	56	44	30	30	28	14	12
X20	36	1	60	66	76	40	78	74	78	70	82	70	86	74	68	74	78	84	72	74
X21	74	1	62	70	64	62	36	42	36	42	38	34	82	64	74	80	82	96	22	64
X22	52	2	62	68	62	68	62	48	58	58	58	56	56	58	32	30	22	34	24	18
X23	46	2	62	58	56	48	56	62	54	70	42	52	60	58	50	58	58	60	48	26
X24	51	1	64	60	58	52	48	58	52	44	62	52	68	54	56	52	74	36	46	42
X25	63	1	64	72	70	60	62	60	70	74	74	80	60	74	30	34	42	34	8	10
X26	58	1	64	62	72	68	54	68	64	78	72	70	70	88	40	42	52	58	36	30
X27	47	1	66	66	68	46	62	78	70	68	62	68	60	62	36	46	36	28	26	24
X28	80	1	66	66	62	64	56	58	64	54	64	60	62	68	16	16	14	12	8	16
X29	56	1	66	60	72	64	72	76	68	66	68	72	60	66	48	38	42	42	28	24

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X30	66	1	68	50	60	42	40	44	68	40	50	54	48	52	44	30	36	36	20	40
X31	46	2	68	88	70	84	78	82	80	76	74	70	66	76	30	22	14	54	62	10
X32	49	2	68	66	56	46	52	58	54	60	54	68	72	52	56	24	26	28	18	18
X33	37	1	68	104	64	80	78	68	70	76	62	84	64	84	42	48	50	46	70	60
X34	63	2	68	54	66	38	56	54	52	58	44	50	54	50	8	8	12	16	6	8
X35	62	1	68	68	72	66	74	60	74	82	62	64	76	60	46	24	44	22	28	26
X36	53	1	70	50	52	68	50	62	64	42	52	54	54	58	62	66	74	56	60	26
X37	59	2	70	82	66	50	66	64	76	56	54	46	48	58	60	66	80	70	84	40
X38	57	2	72	70	70	60	54	46	56	54	64	70	60	64	38	40	62	54	34	24
X39	68	2	72	96	70	86	80	74	64	80	92	94	72	62	102	60	94	94	68	66
X40	63	2	72	68	70	36	66	68	58	78	80	72	68	70	64	72	56	68	64	66
X41	75	2	76	52	76	60	56	76	74	132	90	110	30	38	40	24	112	70	26	22
X42	45	1	76	70	68	72	70	64	80	70	70	70	74	78	76	62	70	62	58	58
X43	58	1	78	84	76	74	72	78	70	66	68	72	76	86	14	8	10	8	14	6
X44	54	1	78	64	64	68	74	64	66	72	56	70	70	80	104	116	78	76	44	50
X45	66	2	80	80	80	78	68	70	78	66	72	74	78	78	64	74	66	60	66	74
X46	54	1	80	66	76	40	78	74	78	70	82	74	68	74	78	74	78	84	72	74
X47	69	1	82	70	72	64	86	76	100	76	94	68	88	58	90	46	96	46	78	82
X48	68	2	82	66	68	52	52	44	50	74	32	50	118	66	20	20	54	34	48	28
X49	76	1	82	89	76	82	90	84	112	98	102	76	86	72	50	60	104	98	76	40
X50	56	1	82	80	72	78	68	76	66	74	68	74	68	84	54	56	22	36	10	16
X51	67	1	82	76	94	56	66	74	52	48	88	56	78	56	42	48	42	44	54	46
X52	43	1	84	74	72	78	76	74	76	76	72	78	78	78	68	68	68	92	72	88
X53	76	2	86	88	112	116	82	74	136	84	134	116	132	72	150	92	102	114	92	92
X54	50	2	96	54	60	58	88	82	70	68	72	70	54	82	52	26	60	32	28	50
X55	67	2	100	56	82	52	66	68	48	60	70	54	84	54	48	30	62	56	46	54
X56	56	2	102	98	78	84	72	70	84	80	74	70	80	68	60	58	60	66	50	42
X57	62	2	104	60	70	60	74	72	88	86	72	66	94	88	62	78	56	62	40	48
X58	60	2	110	108	102	80	94	94	88	80	102	80	106	74	76	68	82	70	50	46
X59	55	1	110	94	150	136	74	78	112	82	76	92	98	82	50	42	86	106	58	44
X60	49	1	114	112	94	84	108	96	144	98	118	110	102	94	112	126	90	120	96	104
X61	45	2	116	68	72	78	76	78	82	66	76	72	78	72	66	62	80	56	56	86
X62	65	1	126	134	84	50	76	104	116	118	94	126	66	54	134	122	56	76	22	22
X63	48	2	126	100	102	40	98	62	122	90	110	96	106	50	94	66	96	76	84	54
X64	41	2	132	116	102	96	88	72	92	86	86	100	106	86	74	82	72	72	68	56
X65	72	1	134	114	88	84	76	92	96	74	116	84	86	70	28	48	52	62	36	36

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X66	64	2	136	188	120	102	118	82	124	120	128	168	104	158	110	104	122	94	58	78
X67	38	1	138	132	142	100	102	90	114	126	114	112	132	112	92	96	110	108	90	80
X68	55	1	152	122	104	122	110	78	108	112	102	110	116	124	82	72	94	80	94	74
X69	53	1	154	150	136	126	142	122	156	140	144	116	114	112	62	86	62	82	112	86
X70	41	1	154	108	106	102	108	90	112	98	110	98	102	96	96	80	96	86	38	84

PRE	BL_L	BL_R	GB_L	GB_R	ST_L	ST_R	LOW	MEDI	HIGH	YIN	YANG	PIE	E_L	E_S	U_L	L_R	Y_Y
X1	54	40	60	58	54	88	87	101	115	108	94	33	101	34	57	5	12
X2	6	6	12	12	10	8	6	14	22	15	14	79	14	91	52	5	7
X3	24	36	22	22	24	26	16	24	32	25	24	84	24	91	5	4	2
X4	12	16	16	12	18	8	14	22	30	26	20	49	22	72	56	33	23
X5	14	24	16	16	28	22	18	25	32	30	21	63	25	79	29	9	29
X6	24	18	10	20	16	18	19	26	33	26	27	62	26	80	55	13	3
X7	26	14	24	16	10	10	20	27	34	28	26	53	27	79	65	3	8
X8	18	10	18	14	24	30	26	34	42	38	31	58	34	82	48	12	19
X9	8	10	22	14	40	36	24	32	40	33	32	53	32	81	45	21	2
X10	66	58	64	36	40	42	33	42	51	41	45	72	42	87	19	6	8
X11	50	40	44	40	68	54	46	57	68	60	55	44	57	76	14	24	8
X12	24	30	30	36	42	56	29	37	45	39	36	77	37	89	3	7	8
X13	12	30	10	16	14	8	20	27	34	28	28	52	27	80	62	1	0
X14	10	10	10	10	12	14	19	26	33	28	25	51	26	77	73	7	10
X15	46	36	60	26	70	82	46	56	66	56	57	74	56	80	10	6	2
X16	42	42	42	66	38	52	36	45	54	41	50	62	45	85	11	1	17
X17	12	24	20	14	18	12	21	28	35	33	25	61	28	79	52	6	24
X18	72	72	56	36	56	42	46	57	68	54	62	55	57	76	26	8	13
X19	38	24	24	32	20	22	29	38	47	39	39	62	38	76	48	6	0
X20	80	82	62	82	76	72	62	75	86	72	76	88	74	88	3	5	5
X21	32	46	50	68	76	74	47	58	69	63	54	54	58	71	17	11	14
X22	12	16	12	14	18	18	31	40	49	44	36	57	40	78	64	1	18
X23	20	30	48	36	44	54	40	50	60	54	47	69	50	82	21	2	11
X24	40	38	42	34	58	96	54	48	41	51	61	63	51	87	17	16	10
X25	24	22	20	36	30	54	38	40	58	46	52	48	48	71	58	9	11

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X26	24	22	42	36	52	42	44	54	64	54	55	61	54	75	42	3	2
X27	50	42	42	32	42	36	40	50	60	49	53	61	50	80	43	3	8
X28	22	10	26	10	20	16	29	38	47	38	40	40	38	76	76	6	4
X29	16	28	40	24	30	42	40	50	60	53	48	57	50	77	50	1	8
X30	20	22	46	34	56	50	36	45	54	45	46	58	45	83	24	10	2
X31	14	18	12	6	34	20	40	50	60	55	46	31	50	66	67	0	17
X32	12	32	22	16	36	32	33	42	51	43	43	55	42	76	54	4	1
X33	70	56	70	54	58	52	54	65	76	65	67	60	65	78	25	5	2
X34	8	10	8	10	8	10	23	31	39	33	30	43	31	73	82	6	8
X35	34	26	32	34	44	34	40	50	60	50	52	49	50	77	52	13	3
X36	62	50	50	66	92	60	47	58	69	58	59	64	58	75	6	11	1
X37	40	60	84	78	84	86	55	56	77	68	65	68	66	89	13	7	4
X38	40	26	34	36	44	36	40	50	60	52	49	65	50	83	36	7	6
X39	66	82	70	58	86	78	65	77	89	81	75	78	77	89	0	0	8
X40	82	70	66	70	70	68	56	67	78	64	71	78	67	87	1	1	9
X41	12	16	24	38	78	35	46	56	66	58	56	25	56	48	42	3	2
X42	40	52	52	58	58	56	54	65	76	67	63	78	65	89	18	2	5
X43	16	18	18	10	8	8	34	43	52	44	43	31	43	66	84	0	1
X44	46	44	46	48	82	74	56	68	80	73	63	73	68	74	3	3	14
X45	74	76	78	78	76	72	61	75	85	72	75	91	79	100	4	0	4
X46	80	82	62	82	76	72	62	75	86	72	76	88	74	88	3	5	5
X47	54	72	90	82	92	90	63	75	87	71	80	57	75	68	5	21	11
X48	42	46	74	64	58	38	43	53	63	47	59	31	53	58	30	16	20
X49	86	66	72	82	98	84	73	86	99	87	86	56	86	33	20	0	0
X50	18	16	30	26	26	34	42	57	62	54	51	43	52	70	62	8	6
X51	42	52	58	52	48	52	47	58	69	60	57	56	58	82	29	11	5

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X52	68	54	72	70	70	72	62	74	86	76	72	88	74	92	5	2	5
X53	96	82	100	90	82	88	86	100	114	100	101	62	100	76	4	15	0
X54	22	36	26	64	24	24	44	54	64	57	51	38	54	71	48	0	10
X55	56	44	46	60	42	42	46	57	68	60	55	50	57	73	26	16	8
X56	48	50	42	50	52	50	55	66	77	70	62	67	66	79	34	1	10
X57	18	24	64	36	74	72	54	65	76	66	65	56	65	66	32	7	0
X58	20	48	32	76	56	82	64	76	88	82	70	46	76	66	36	1	0
X59	26	22	14	18	38	14	58	70	82	86	56	26	70	42	56	9	34
X60	98	146	130	112	136	114	95	110	125	105	117	71	110	85	7	1	10
X61	40	64	70	84	70	56	59	71	83	75	69	59	71	72	15	4	7
X62	34	34	38	26	54	74	64	76	88	84	70	29	76	55	39	4	17
X63	26	68	78	64	56	54	67	79	91	83	77	28	79	61	25	25	7
X64	74	64	72	68	74	70	70	83	96	86	82	72	83	74	27	6	5
X65	34	32	46	38	86	80	58	70	82	71	70	42	70	57	48	7	0
X66	62	98	98	82	122	100	96	111	126	109	114	48	111	51	27	5	3
X67	90	80	102	108	90	114	92	107	122	107	108	70	107	85	17	4	1
X68	72	70	114	82	106	112	86	100	114	99	102	65	100	74	22	7	3
X69	82	120	110	74	120	76	96	111	126	110	114	40	111	69	33	7	3
X70	62	66	82	84	84	86	78	92	106	96	90	68	92	55	26	6	5

Appendices

POST	LU_L	LU_R	PC_L	PC_R	HT_L	HT_R	SI_L	SI_R	TE_L	TE_R	LI_L	LI_R	SP_L	SP_R	LR_L	LR_R	KI_L	KI_R
X1	156	152	88	82	90	94	94	96	88	90	84	104	74	80	60	70	70	64
X2	44	54	62	24	64	58	36	32	56	32	54	36	28	20	46	20	24	18
X3	44	34	42	34	36	46	28	32	36	28	34	32	16	20	18	16	14	18
X4	60	78	72	76	74	66	64	60	60	64	70	68	68	34	78	54	42	38
X5	82	84	96	76	70	84	78	70	78	68	88	62	72	56	74	70	42	50
X6	54	46	38	28	32	30	36	32	34	34	38	30	38	34	38	42	20	36
X7	102	40	56	42	118	84	40	48	38	70	74	48	20	108	22	46	38	30
X8	42	48	60	54	54	58	60	58	74	58	60	62	66	56	62	78	64	54
X9	74	88	52	62	64	58	62	68	60	70	58	64	50	42	52	58	50	70
X10	56	38	40	38	42	34	50	48	36	44	48	40	38	40	46	36	30	40
X11	124	92	68	74	70	74	90	96	76	98	82	70	70	54	82	58	50	32
X12	64	66	66	62	74	78	98	68	68	72	66	68	66	70	66	70	46	80
X13	52	36	52	28	42	68	56	56	58	70	64	36	48	46	52	8	24	30
X14	72	76	78	58	70	70	68	72	68	66	74	62	32	30	28	26	32	36
X15	72	60	56	62	60	58	60	60	62	60	70	62	54	58	54	70	70	60
X16	34	36	34	26	26	28	34	30	32	28	22	30	18	18	18	34	8	14
X17	70	74	70	72	60	68	68	60	62	62	70	56	40	68	24	28	34	36
X18	80	84	70	64	64	78	68	66	74	72	96	56	22	32	72	40	58	40
X19	104	102	122	116	130	188	88	122	90	136	126	108	104	72	70	100	94	96
X20	116	110	76	90	84	72	86	80	74	84	92	94	68	72	68	94	68	76
X21	98	86	104	108	72	72	128	122	80	82	102	98	108	146	136	158	60	124
X22	100	76	46	62	56	62	70	52	36	46	62	86	90	64	38	86	28	24
X23	112	96	96	80	90	82	90	102	108	96	60	68	92	76	80	78	40	38
X24	76	72	72	74	86	70	70	84	78	82	78	74	46	62	80	68	50	68

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X25	62	80	52	68	64	78	72	74	56	64	52	62	60	68	60	64	20	44
X26	126	108	128	84	148	88	126	84	108	152	114	100	144	88	90	92	56	60
X27	58	60	64	70	88	60	64	64	70	58	64	70	64	44	60	48	46	42
X28	80	86	104	76	74	130	86	54	128	54	92	106	36	56	52	54	24	32
X29	68	70	92	58	76	74	90	84	98	92	46	76	38	52	62	70	48	46
X30	64	62	68	46	44	54	42	56	50	36	50	72	24	22	40	46	22	20
X31	68	70	64	62	74	76	62	72	78	64	82	74	48	8	74	20	26	50
X32	80	80	62	80	72	96	62	60	84	78	76	72	68	62	62	62	28	28
X33	66	62	60	62	66	78	62	56	58	62	60	58	74	50	88	68	84	58
X34	70	58	52	48	60	70	62	60	68	60	50	48	80	64	68	56	56	42
X35	104	68	66	84	60	68	70	76	68	68	72	76	68	50	70	40	24	24
X36	94	78	80	70	72	74	48	46	72	64	86	72	54	54	56	54	50	58
X37	74	60	54	30	48	50	60	48	40	62	42	42	56	34	40	66	42	32
X38	166	154	106	106	116	104	140	136	146	112	126	130	104	94	116	78	84	86
X39	86	84	82	76	88	78	80	80	78	86	74	68	90	94	76	80	60	74
X40	76	70	68	66	78	88	90	84	84	80	92	86	52	60	70	58	58	64
X41	86	72	78	74	72	70	56	62	68	64	54	60	26	24	41	26	36	32
X42	66	66	56	56	64	74	66	66	66	70	62	66	66	70	66	48	54	62
X43	62	82	74	72	70	74	62	70	68	70	72	94	26	28	16	16	32	36
X44	74	70	82	68	54	60	60	64	72	76	78	68	28	52	34	58	52	44
X45	86	90	88	70	76	74	88	74	84	70	84	86	66	70	80	76	84	70
X46	116	110	76	90	84	72	86	80	74	84	92	94	68	72	68	76	68	76
X47	58	78	72	80	72	76	70	70	68	70	74	74	50	6	54	30	32	38
X48	58	78	82	62	58	64	64	62	54	76	70	66	42	40	62	60	54	52
X49	138	200	104	86	100	84	108	80	94	78	112	90	96	80	84	120	86	66

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X50	72	72	80	76	70	74	62	76	74	72	78	68	68	78	54	70	22	54
X51	86	90	86	76	78	72	90	86	106	78	88	74	36	38	38	36	56	60
X52	64	66	66	62	74	78	98	68	68	72	66	68	66	70	66	70	46	80
X53	108	102	140	106	96	104	120	104	80	92	104	98	112	86	94	82	80	84
X54	92	104	78	88	110	110	82	92	116	68	84	90	70	32	50	28	22	32
X55	78	88	106	94	74	74	80	72	70	74	76	86	76	82	78	102	94	68
X56	76	72	72	68	64	66	70	70	74	66	68	62	64	72	68	72	66	66
X57	56	56	64	48	48	50	54	58	50	50	66	48	54	54	52	50	30	38
X58	102	96	96	76	70	94	82	92	82	94	92	78	92	118	104	128	76	62
X59	88	90	68	46	78	84	92	62	84	82	76	68	52	28	108	76	30	38
X60	112	112	92	82	90	106	114	84	102	88	118	80	114	106	86	100	72	76
X61	70	60	136	56	66	68	56	42	66	52	74	52	58	56	66	68	64	58
X62	84	70	118	70	76	76	46	34	46	50	72	62	62	88	60	52	28	34
X63	154	80	92	52	68	48	80	50	80	62	104	64	112	70	72	70	102	50
X64	90	84	62	72	54	64	64	70	64	72	60	84	60	74	60	68	56	60
X65	54	70	76	68	76	80	84	88	86	78	72	76	72	68	74	78	52	54
X66	106	108	84	76	152	76	106	104	90	88	82	94	108	102	118	108	64	74
X67	166	134	138	136	124	110	148	128	134	132	144	136	110	116	122	144	114	118
X68	98	86	82	108	76	60	72	94	74	88	122	108	66	90	100	78	84	64
X69	138	120	106	82	116	88	114	86	126	90	112	88	56	94	88	74	72	72
X70	74	70	78	76	64	66	106	74	66	66	74	70	64	64	84	74	48	70

Appendices

POST	BL_L	BL_R	GB_L	GB_R	ST_L	ST_R	LOW	MEDI	HIGH	YIN	YANG	PIE	E_L	E_S	U_L	L_R	Y_Y
X1	66	56	56	70	70	108	72	85	98	90	82	64	85	62	30	6	9
X2	26	12	16	22	20	22	26	34	42	39	30	41	34	79	50	26	21
X3	24	30	20	26	12	16	20	27	34	28	27	71	27	87	46	2	5
X4	54	54	56	48	52	54	49	60	71	62	59	66	60	87	22	7	4
X5	52	44	64	70	40	44	56	67	78	71	63	64	67	82	27	6	11
X6	36	34	28	34	56	32	27	35	43	36	35	79	35	87	0	8	2
X7	50	26	52	32	12	22	40	50	60	59	43	28	50	54	39	4	27
X8	58	44	48	42	62	66	46	57	68	58	58	83	57	90	1	4	0
X9	38	48	38	54	74	74	49	60	71	60	61	75	60	84	14	8	1
X10	46	46	42	30	40	38	32	41	50	40	42	84	41	93	8	8	5
X11	54	38	46	46	80	60	58	70	82	71	70	44	70	64	33	11	1
X12	48	42	84	72	66	74	56	58	80	67	69	76	68	82	7	1	2
X13	42	42	22	26	48	42	34	43	52	41	47	44	43	75	30	12	13
X14	16	20	28	28	34	14	38	40	58	51	46	50	48	75	61	6	9
X15	66	58	56	44	58	58	49	60	71	62	60	89	60	95	6	2	4
X16	26	16	16	32	20	26	18	25	32	25	26	67	25	89	31	9	5
X17	26	22	30	30	26	24	39	49	59	54	45	55	49	81	51	3	16
X18	72	58	52	52	70	56	51	62	75	59	66	57	62	72	27	11	10
X19	52	104	94	82	114	76	89	103	117	108	99	46	103	47	26	8	8
X20	84	90	60	86	80	88	70	83	96	83	83	78	83	84	11	7	0
X21	22	70	100	108	156	144	89	103	117	106	101	52	103	47	13	11	4
X22	16	10	34	30	32	26	41	51	61	61	42	34	51	62	38	2	31
X23	44	42	54	50	74	60	63	75	87	80	71	56	75	74	32	7	11
X24	52	62	64	66	52	50	56	58	80	69	68	73	68	90	21	3	1

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X25	40	40	52	40	68	58	47	58	69	60	57	67	58	78	21	11	5
X26	76	76	96	78	98	80	85	99	113	100	99	40	99	66	25	16	1
X27	60	60	64	50	62	72	49	60	71	59	63	74	60	86	14	8	7
X28	8	24	22	42	30	44	51	62	75	67	58	27	62	48	60	2	14
X29	46	62	64	52	52	64	54	65	76	63	69	55	65	79	29	2	8
X30	20	18	20	30	52	28	33	42	51	43	42	53	42	79	41	7	1
X31	40	26	74	78	74	64	48	59	70	53	66	47	59	71	31	13	18
X32	18	20	36	46	66	66	50	61	72	65	57	59	61	70	37	4	12
X33	62	62	126	64	124	78	58	70	82	68	73	50	70	72	20	18	6
X34	32	34	44	42	64	70	46	56	66	60	53	76	56	84	7	7	12
X35	26	8	40	36	34	40	45	55	65	61	51	44	56	60	47	9	15
X36	44	40	58	48	62	62	51	62	73	66	59	68	62	82	25	7	11
X37	38	36	46	54	44	72	38	50	58	49	49	61	48	85	8	0	0
X38	96	76	102	100	100	90	96	111	126	110	113	63	111	71	26	9	2
X39	66	74	68	74	70	90	65	77	89	80	76	91	77	96	5	3	5
X40	70	70	66	58	58	64	59	71	83	67	75	74	71	90	22	1	10
X41	22	24	18	12	28	40	37	47	57	53	42	49	47	70	59	4	20
X42	42	50	52	60	64	58	50	61	72	62	60	83	61	93	11	2	3
X43	18	28	20	18	20	20	37	47	57	49	47	41	47	68	68	11	4
X44	36	34	26	52	48	62	46	56	66	56	56	58	56	80	36	9	0
X45	120	118	94	102	92	92	71	84	97	78	92	79	84	85	8	4	15
X46	84	90	60	86	80	88	70	83	96	83	83	78	83	84	11	7	0
X47	34	34	58	40	60	46	46	56	66	54	58	51	56	71	44	8	7
X48	60	72	90	92	80	72	54	65	76	59	72	67	65	83	2	2	17
X49	90	78	72	74	98	96	82	96	110	104	89	54	96	47	18	4	13

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X50	28	30	54	46	76	58	52	63	74	66	60	63	63	80	27	4	8
X51	80	88	52	54	58	56	57	69	81	63	76	57	69	75	35	5	17
X52	48	42	84	72	66	74	56	68	80	67	69	76	68	82	7	1	2
X53	94	68	104	96	84	86	82	96	110	100	94	75	96	78	14	8	5
X54	36	30	16	44	30	20	52	63	74	68	59	27	63	59	63	6	13
X55	88	72	96	70	100	100	70	83	96	85	82	82	83	93	5	3	2
X56	66	60	78	66	62	60	56	62	78	69	67	92	67	100	3	3	2
X57	22	32	38	54	64	68	40	50	60	50	50	72	50	84	14	1	0
X58	66	98	86	94	134	94	78	91	104	93	91	69	91	77	8	3	1
X59	20	24	26	16	40	22	47	58	69	66	51	25	58	62	47	16	22
X60	88	60	116	88	100	106	81	93	109	96	95	77	95	85	5	9	0
X61	62	66	66	54	56	64	52	63	74	68	59	69	63	62	6	18	12
X62	36	28	34	32	42	72	46	57	68	68	46	42	57	63	29	5	32
X63	38	90	106	82	84	62	66	78	90	81	75	32	78	53	0	28	7
X64	64	74	60	70	56	72	56	67	78	67	68	80	67	92	7	13	0
X65	54	54	72	78	74	78	59	71	83	69	75	82	71	92	11	2	8
X66	90	82	108	96	140	124	85	99	113	98	100	78	99	70	3	9	2
X67	110	112	144	134	130	146	114	130	146	128	133	84	130	91	7	2	4
X68	52	62	84	56	62	74	67	80	93	83	79	55	80	77	18	0	4
X69	82	86	94	72	96	90	79	93	107	92	95	49	93	72	22	13	2
X70	56	98	64	66	70	66	59	71	83	69	73	74	71	81	6	1	5

PRE	AGE	gen	LU_L	LU_R	PC_L	PC_R	HT_L	HT_R	SI_L	SI_R	TE_L	TE_R	LI_L	LI_R	SP_L	SP_R	LR_L	LR_R	KI_L	KI_R
X1	58	2	14	24	34	10	20	22	18	26	26	24	22	12	12	12	10	22	12	10

Appendices

X2	65	1	24	14	30	12	36	26	18	40	30	14	26	16	12	12	6	6	8	12
X3	51	1	24	14	14	12	18	18	14	40	18	22	18	18	8	8	20	30	6	6
X4	66	1	26	26	16	24	32	26	28	12	24	16	20	24	42	26	18	22	10	14
X5	50	1	44	30	40	22	32	32	36	32	38	32	14	24	24	14	14	16	32	26
X6	49	1	48	42	36	42	42	48	46	58	42	42	44	38	34	34	32	46	30	32
X7	57	1	48	70	54	48	32	36	38	38	34	38	66	68	26	14	16	8	6	16
X8	60	2	50	60	32	30	38	18	38	36	32	32	32	24	26	24	20	34	28	24
X9	56	2	52	12	20	12	18	14	14	14	24	20	16	12	8	20	8	14	14	8
X10	63	2	56	50	58	38	58	60	48	48	50	70	54	46	42	50	30	30	34	24
X11	68	1	58	40	58	58	42	60	36	54	48	42	62	50	26	20	32	30	18	26
X12	60	1	58	68	68	66	62	68	64	68	68	62	70	70	60	54	54	46	12	56
X13	70	1	62	78	60	66	56	50	42	52	62	50	76	58	62	30	42	34	20	30
X14	66	1	64	70	82	62	74	80	70	70	70	112	78	70	56	26	78	54	24	60
X15	82	1	64	60	72	78	44	108	66	72	64	84	60	64	18	14	30	14	12	16
X16	70	1	64	72	68	72	70	80	58	68	78	76	58	56	12	14	24	14	26	24
X17	39	1	64	88	94	78	62	52	68	58	56	70	86	92	34	34	52	30	38	28
X18	71	1	66	60	70	46	74	66	74	104	74	66	70	74	112	98	66	72	68	62
X19	62	2	66	66	76	70	76	70	92	74	76	64	68	66	62	44	48	34	32	34
X20	65	2	68	72	72	46	72	72	68	68	80	56	82	52	58	52	34	54	34	12
X21	68	2	68	60	46	52	50	58	50	44	66	50	70	50	32	40	46	50	40	36
X22	60	2	68	76	70	82	62	58	72	68	68	70	68	74	56	44	56	44	24	32
X23	65	1	68	50	68	50	62	70	60	62	58	66	60	66	22	16	34	42	30	22
X24	43	2	68	60	48	52	50	58	50	44	66	50	70	50	32	40	48	50	40	36
X25	35	2	70	42	48	26	42	46	64	46	44	36	48	42	22	8	10	10	18	18

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X26	62	1	70	68	84	68	52	74	56	74	82	76	60	64	40	28	38	50	34	34
X27	61	1	70	82	76	64	162	118	108	68	70	74	142	64	72	74	70	74	62	68
X28	54	2	72	74	64	80	66	82	70	76	68	76	68	82	62	60	72	56	46	34
X29	42	2	76	68	72	60	84	78	88	70	96	68	68	64	60	54	100	52	38	48
X30	39	2	76	74	78	72	66	74	74	68	62	66	68	70	72	60	30	44	52	50
X31	47	1	78	52	64	94	68	44	78	74	72	66	76	56	48	46	58	64	46	50
X32	48	2	80	72	54	60	48	36	80	50	68	64	60	80	48	44	44	38	60	42
X33	54	1	80	80	100	82	84	70	80	84	88	80	70	80	26	18	34	42	36	38
X34	53	2	80	54	74	58	58	62	48	54	66	54	60	60	46	34	38	36	54	40
X35	43	2	84	68	98	82	86	92	88	100	136	88	120	102	66	58	84	72	54	64
X36	51	2	88	76	74	62	72	52	72	64	68	56	64	70	30	20	30	22	24	14
X37	47	1	88	78	74	74	60	60	62	70	64	68	80	92	62	58	64	60	46	48
X38	66	2	90	70	78	74	112	60	42	96	96	86	70	68	42	30	34	56	16	16
X39	75	1	92	98	96	106	92	102	92	104	102	108	98	100	86	52	72	50	50	70
X40	67	1	92	88	80	84	66	90	158	44	118	108	66	114	114	92	54	50	40	72
X41	48	1	96	84	90	80	54	54	78	90	92	88	76	64	94	96	98	84	66	94
X42	58	1	96	90	66	66	76	66	80	82	74	72	74	66	46	26	16	24	26	26
X43	70	1	98	110	114	66	116	104	64	86	98	122	88	114	30	34	28	82	36	24
X44	87	1	98	90	138	96	110	102	146	110	134	136	102	114	62	94	72	74	56	68
X45	73	1	98	72	70	78	68	70	76	90	70	76	72	74	14	12	14	12	16	14
X46	87	1	98	90	138	96	110	102	146	110	134	136	102	114	62	94	72	74	56	68
X47	65	2	100	104	84	72	94	96	100	60	118	78	72	72	82	40	94	56	16	22
X48	72	2	102	104	102	94	98	78	94	92	110	94	98	66	88	106	96	100	92	104
X49	56	2	104	96	68	80	76	80	76	76	88	86	92	86	74	70	88	78	8	38

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X50	61	1	104	70	118	48	70	70	94	72	64	78	82	50	58	48	56	62	36	62
X51	61	2	106	94	112	90	122	88	106	90	126	110	146	90	86	92	82	72	48	54
X52	46	1	110	140	142	126	148	136	142	124	120	136	124	100	24	26	58	54	16	10
X53	58	1	112	106	98	88	86	108	110	122	98	90	102	96	112	120	96	88	96	88
X54	59	1	116	116	66	66	66	56	76	82	72	64	72	84	52	62	74	80	86	96
X55	68	1	126	120	96	92	144	134	122	108	130	116	88	76	58	70	56	46	22	34
X56	54	1	132	108	86	74	70	82	82	76	60	66	116	84	120	138	132	122	136	96
X57	56	2	146	154	128	120	126	106	134	128	120	132	156	142	52	54	96	102	106	108
X58	52	1	148	120	114	84	200	98	120	112	114	86	128	104	46	52	62	64	40	26
X59	48	2	150	132	136	106	102	94	108	114	124	128	110	94	54	52	108	78	78	68
X60	57	2	158	106	108	78	126	110	122	140	132	130	120	108	134	102	146	136	152	134

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PRE	BL_L	BL_R	GB_L	GB_R	ST_L	ST_R	LOW	MEDI	HIGH	YIN	YANG	PIE	E_L	E_S	U_L	L_R	Y_Y
X1	12	14	16	10	18	8	9	17	25	17	17	69	17	89	38	9	1
X2	14	8	10	16	10	6	8	16	24	17	17	57	16	85	58	18	4
X3	10	12	8	10	8	20	7	15	23	15	17	62	15	85	36	20	10
X4	12	14	18	18	18	18	13	21	29	24	19	72	21	87	16	8	20
X5	20	28	26	32	30	34	21	28	35	27	29	68	28	89	21	8	5
X6	24	14	18	18	26	44	28	36	44	39	35	67	36	83	33	7	11
X7	22	8	16	10	10	8	22	30	38	31	29	55	30	72	71	4	7
X8	22	28	16	22	42	26	22	30	38	32	29	64	30	82	25	5	9
X9	16	10	12	24	10	14	8	16	24	17	16	61	16	80	30	17	7
X10	24	46	26	46	34	26	34	43	52	44	43	58	43	83	35	3	2
X11	24	14	8	12	56	28	29	37	45	39	36	47	37	78	51	7	7
X12	40	22	44	46	52	66	46	56	66	56	56	63	56	79	30	5	0
X13	24	32	34	40	34	26	37	46	55	49	44	54	46	77	42	4	10
X14	34	42	14	70	72	74	51	62	73	61	65	44	62	60	33	9	5
X15	20	14	40	14	22	22	35	44	53	44	45	35	44	58	71	8	2
X16	34	36	42	20	14	16	36	45	54	45	46	44	45	72	66	0	2
X17	22	22	44	44	48	40	44	54	64	55	54	51	54	72	49	4	0
X18	72	72	64	72	70	92	61	75	85	72	75	71	73	77	8	0	4
X19	16	18	16	22	46	14	42	52	62	57	48	43	52	68	55	14	15
X20	16	18	18	44	20	28	30	54	64	54	55	36	54	79	37	22	2
X21	30	30	44	32	34	46	37	46	55	48	46	67	46	86	30	4	5
X22	12	30	48	48	60	64	46	56	66	56	57	60	56	73	36	3	1
X23	30	22	24	36	46	42	37	46	55	45	48	51	46	79	50	3	6
X24	30	30	44	32	34	48	37	46	55	48	46	67	46	86	30	4	5
X25	14	18	22	20	18	24	23	31	39	30	33	49	31	73	63	19	9
X26	14	16	46	38	60	40	42	52	62	53	52	49	52	72	47	0	2
X27	76	74	68	72	68	68	68	81	94	83	79	64	81	62	22	13	4
X28	52	62	48	48	54	46	52	63	74	64	63	70	63	85	27	4	2
X29	46	44	36	56	44	34	51	62	79	66	60	50	62	76	31	14	9
X30	48	40	54	52	56	40	49	60	71	62	58	70	60	85	29	3	6

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X31	68	38	54	50	64	62	50	61	72	59	63	53	61	81	21	10	6
X32	68	80	64	70	70	28	47	58	69	52	65	54	58	82	12	10	19
X33	24	20	38	20	28	48	46	56	66	58	55	41	56	67	61	3	4
X34	32	22	30	32	34	38	38	48	58	53	44	59	48	78	40	12	16
X35	50	62	76	84	78	62	68	81	94	76	87	60	81	69	29	8	13
X36	48	26	52	44	30	34	39	59	59	47	52	43	49	70	54	17	10
X37	60	64	82	72	60	68	56	67	78	64	70	79	67	87	14	1	8
X38	14	44	16	16	46	26	44	54	64	57	52	31	54	59	62	2	8
X39	52	82	62	44	78	62	68	81	94	81	82	56	81	80	36	0	1
X40	68	50	58	52	60	50	65	77	89	77	79	41	77	52	31	8	2
X41	84	62	98	94	108	96	71	84	97	83	86	75	84	85	11	4	3
X42	14	24	32	34	24	30	41	51	61	52	51	43	51	66	64	2	2
X43	30	18	18	20	30	12	53	64	75	70	58	18	64	54	69	5	16
X44	24	68	82	60	72	58	77	90	103	88	92	48	90	52	42	2	4
X45	20	24	8	16	22	14	36	45	54	45	47	32	45	61	79	0	4
X46	24	68	82	60	72	58	77	90	103	88	92	48	90	52	42	2	4
X47	16	16	44	52	42	60	55	66	77	72	61	27	66	58	48	15	15
X48	84	90	94	84	100	116	81	95	109	97	94	86	95	89	1	2	3
X49	34	46	70	62	82	56	59	71	83	72	71	59	71	62	29	0	0
X50	34	68	60	48	64	66	54	65	76	67	65	42	65	67	28	11	2
X51	44	58	94	86	86	88	77	90	103	87	94	53	90	62	30	12	6
X52	38	56	68	68	26	58	72	85	98	83	88	30	85	43	67	1	6
X53	68	110	76	112	110	102	85	99	113	100	100	85	99	87	3	5	0
X54	94	54	92	96	102	148	69	82	95	78	86	70	82	64	9	3	9
X55	22	50	54	58	64	66	68	81	94	83	80	46	81	51	55	1	4
X56	118	94	122	104	108	114	87	101	115	108	95	48	101	76	26	9	11
X57	78	48	116	124	124	94	97	112	127	108	116	62	112	62	30	5	7
X58	66	60	50	58	46	44	72	85	98	88	82	29	85	25	57	16	6
X59	86	92	108	104	90	82	85	99	113	97	103	61	99	65	28	8	6

HIV RAW DATA																				
EXP	Age	Gen	LU-L	LU-R	PC-L	PC-R	HT-L	HT-R	SI-L	SI-R	TE-L	TE-R	LI-L	LI-R	SP-L	SP-R	LR-L	LR-R	KI-L	KI-R
H1	7	2	172	152	150	132	132	144	146	128	132	144	170	148	142	130	120	114	134	120
H2	6	1	126	116	126	118	96	94	126	120	120	144	132	116	94	100	100	80	84	74
H3	7	2	118	146	132	98	84	106	100	104	98	98	100	126	74	92	100	108	106	106
H4	11	2	130	138	146	102	156	128	152	120	150	122	130	98	144	160	170	188	170	178
H5	8	1	200	192	200	132	174	188	200	164	180	158	182	144	200	154	200	194	132	160
H6	7	1	116	80	84	80	48	72	66	82	42	84	118	76	60	48	62	68	60	70
H7	13	1	130	94	132	108	106	116	124	88	118	114	98	86	120	106	154	110	106	116
H8	6	1	120	100	112	118	100	88	102	90	118	120	106	116	86	92	96	82	88	124
H9	12	2	106	62	92	80	82	78	106	122	122	154	148	100	118	60	92	62	80	80
H10	8	2	112	78	78	108	70	74	86	74	74	66	98	80	120	122	112	108	102	118
H11	11	1	126	118	106	118	130	112	130	120	136	108	112	146	150	122	158	144	146	166
H12	12	1	96	78	96	94	80	92	102	104	88	92	88	98	72	74	108	74	78	52
H13	11	1	188	140	174	152	134	154	178	136	178	144	174	198	184	188	200	200	200	194
H14	12	1	200	200	132	152	122	200	174	176	144	170	134	178	166	200	200	200	176	200
H15	12	2	92	80	90	96	86	92	78	82	74	84	118	92	94	92	70	84	90	90
H16	14	1	126	178	168	160	160	144	154	150	140	142	150	172	182	168	168	198	154	120
H17	11	1	104	78	96	94	86	82	118	94	94	88	116	106	54	54	52	62	50	86
H18	7	2	154	96	112	114	110	84	158	124	98	80	106	138	106	184	116	200	96	200
H19	11	1	152	94	104	182	94	142	100	86	122	130	136	148	102	108	120	126	158	130
H20	8	2	160	124	112	126	144	110	116	102	136	140	124	116	64	68	74	96	66	94

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H21	9	1	116	98	68	84	110	96	72	82	86	110	76	106	146	76	80	80	74	120
H22	14	1	112	142	86	82	96	88	98	110	90	136	100	76	70	60	110	92	88	98
H23	10	2	170	136	168	182	166	196	154	170	138	160	166	146	156	170	118	168	92	158
H24	13	1	98	78	114	64	90	54	96	62	102	80	108	94	98	82	100	96	94	98
H25	16	1	190	104	98	116	108	82	128	74	82	94	170	106	98	138	104	120	80	150
H26	13	1	100	72	90	88	78	74	88	74	86	82	98	84	62	50	64	54	86	80
H27	13	1	118	110	124	86	126	110	108	118	120	98	122	142	88	144	150	128	148	134
H28	11	2	84	86	98	62	86	50	88	72	100	62	92	60	28	46	56	46	46	38
H29	14	1	182	180	138	162	152	168	142	158	158	142	164	164	124	96	128	96	122	82
H30	14	1	164	96	122	114	84	106	120	110	152	98	138	114	112	90	82	106	86	78
H31	14	1	146	122	52	88	66	88	78	92	64	92	78	98	102	70	182	70	72	80
H32	14	1	160	126	134	114	124	120	138	122	128	138	140	132	108	80	110	100	130	36
H33	10	2	200	164	168	162	98	178	136	168	144	156	144	142	148	120	200	150	120	106
H34	14	1	200	190	174	198	180	182	176	198	176	200	190	200	166	150	172	188	132	160
H35	5	2	144	134	150	122	118	132	124	104	126	128	148	128	84	78	76	62	92	94
H36	5	2	146	138	142	114	102	126	120	132	124	132	122	156	200	84	116	102	120	96
H37	11	1	118	110	104	98	108	102	98	94	70	88	106	110	108	40	100	64	114	92
H38	12	1	152	118	108	118	112	114	86	102	124	120	136	122	96	48	80	88	96	78
H39	8	1	150	128	146	124	138	140	146	132	132	160	136	118	70	92	88	100	62	48
H40	7	1	108	80	86	88	66	84	74	108	76	78	116	78	108	108	110	110	112	92
H41	8	1	200	200	200	200	174	200	188	200	164	200	200	200	200	200	200	200	200	200

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H42	13	1	118	110	124	86	126	110	108	118	120	98	122	142	88	144	150	128	148	134
H43	14	2	170	162	142	138	200	156	200	176	172	200	122	200	76	92	96	74	44	58

EXP	BL-L	BL-R	GB-L	GB-R	ST-L	ST-R	LOW	MEDI	HIGH	YIN	YANG	PIE	EI	Es	U_L	L_R	Y_Y
H1	128	118	150	132	132	144	123	138	153	137	139	78	138	91	10	5	1
H2	100	92	100	86	110	100	91	106	121	101	112	72	106	80	21	5	10
H3	72	96	104	96	94	112	87	102	117	106	100	73	102	78	11	8	5
H4	130	116	152	166	190	176	131	146	161	151	142	45	146	75	18	7	5
H5	184	174	144	192	196	186	161	176	191	177	175	55	176	92	0	7	1
H6	62	86	86	82	88	68	59	74	89	71	78	70	74	73	11	0	9
H7	144	148	156	128	142	130	104	119	134	117	123	60	119	82	15	12	5
H8	70	96	114	110	114	104	87	102	117	101	105	81	102	88	8	1	4
H9	108	86	82	88	98	90	80	95	110	83	109	50	95	65	16	13	23
H10	108	132	136	128	124	114	85	100	115	100	102	60	100	80	29	1	1
H11	110	144	152	124	200	124	117	132	147	133	131	53	132	72	14	8	1
H12	66	70	104	70	106	78	70	85	100	83	89	76	85	84	14	9	6
H13	130	136	180	148	200	200	156	171	186	176	167	53	171	90	9	6	5
H14	150	180	130	146	200	174	156	171	186	179	163	38	171	86	6	11	8
H15	70	122	86	100	88	112	75	90	105	88	92	82	90	87	3	7	4
H16	114	96	160	170	168	190	140	155	170	161	151	56	155	72	2	2	6
H17	40	60	54	66	70	80	63	78	93	75	82	59	78	72	37	1	8
H18	96	154	162	178	134	200	118	133	148	131	136	14	133	59	24	17	3

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H19	106	92	92	86	142	114	104	119	134	126	113	54	119	69	7	0	10
H20	96	98	86	98	68	104	90	105	120	103	107	55	105	67	32	2	3
H21	42	88	76	80	124	122	77	92	107	96	89	62	92	61	0	6	7
H22	86	82	108	82	112	98	80	95	110	94	98	70	95	73	10	0	4
H23	152	160	140	158	192	184	143	158	173	157	160	58	158	71	5	8	2
H24	70	60	94	102	112	104	74	89	104	89	90	71	89	83	6	17	1
H25	100	116	128	152	114	140	101	116	131	116	117	42	116	59	6	0	1
H26	72	60	96	86	78	84	63	78	93	75	82	78	78	86	14	11	9
H27	130	132	156	148	162	168	112	127	142	122	134	57	127	78	18	2	8
H28	56	46	36	44	60	52	47	62	77	61	64	43	62	73	41	20	5
H29	118	78	96	84	114	102	116	131	146	136	127	35	131	67	35	7	6
H30	104	102	98	94	126	112	93	108	123	103	114	56	108	73	16	12	9
H31	88	78	80	86	140	88	76	91	106	95	89	59	91	48	6	8	6
H32	106	82	126	78	112	94	99	114	129	112	116	49	114	55	26	19	3
H33	124	118	146	148	144	96	130	145	160	151	139	44	145	69	12	3	8
H34	172	192	142	200	134	168	161	176	191	174	179	58	176	92	12	9	2
H35	96	118	84	92	90	80	93	108	123	107	110	59	108	72	32	4	2
H36	124	124	114	120	126	108	109	124	139	124	125	69	124	60	7	7	1
H37	114	90	122	96	100	86	82	97	112	97	98	64	97	73	6	15	1
H38	114	114	102	124	92	94	90	105	120	101	111	63	105	63	20	4	9
H39	80	62	114	86	98	84	94	109	124	107	112	45	109	60	40	6	4
H40	86	96	124	110	124	110	82	97	112	96	98	70	97	85	19	4	2
H41	200	200	200	200	200	200	181	196	200	198	196	83	196	100	3	3	0
H42	130	132	156	148	162	168	112	127	142	122	134	57	127	78	18	2	8
H43	56	66	62	68	80	72	105	120	135	117	123	27	120	40	58	2	4

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CON	Age	Gen	LU-L	LU-R	PC-L	PC-R	HT-L	HT-R	SI-L	SI-R	TE-L	TE-R	LI-L	LI-R	SP-L	SP-R	LR-L	LR-R	KI-L	KI-R
H1	8	1	132	126	106	114	94	88	96	88	94	130	120	110	120	120	124	82	78	106
H2	9	1	136	156	148	148	92	162	120	108	104	102	126	124	132	144	78	130	124	116
H3	9	2	136	126	140	88	114	106	122	112	122	98	152	114	142	170	142	138	122	112
H4	9	2	124	146	134	110	110	96	124	122	106	100	128	112	182	168	142	160	124	124
H5	10	2	166	124	130	166	140	136	150	128	120	114	152	180	124	122	118	128	98	110
H6	10	2	182	142	150	116	140	128	168	144	120	108	164	134	144	146	158	154	134	150
H7	10	2	112	72	102	96	70	78	96	78	128	64	98	110	90	86	96	86	66	84
H8	10	2	150	184	134	134	154	142	158	178	134	132	144	138	166	176	162	176	164	158
H9	10	1	148	166	142	132	98	122	138	140	140	114	144	142	120	114	110	124	94	110
H10	11	2	186	200	180	200	166	200	184	200	194	200	186	190	200	200	200	200	200	200
H11	11	2	178	180	158	132	154	158	160	148	160	164	160	112	144	140	126	130	144	144
H12	11	2	178	178	162	148	174	188	162	158	142	138	176	156	180	180	166	198	180	176
H13	11	1	142	126	116	110	98	132	112	102	148	114	144	128	118	142	140	132	130	156
H14	11	1	194	200	190	186	134	200	162	180	134	190	150	140	200	200	200	200	198	200
H15	11	1	134	100	98	100	102	102	110	98	144	62	128	100	104	96	118	134	96	116
H16	11	1	156	120	132	136	114	126	134	144	136	120	124	154	108	162	130	116	92	126
H17	11	1	116	102	114	112	74	68	102	116	80	110	102	136	84	134	122	100	118	126
H18	12	2	188	156	172	160	164	176	172	156	162	158	152	132	142	76	158	192	110	138
H19	12	2	150	112	116	78	130	78	118	100	100	104	100	104	120	112	144	128	96	98
H20	12	1	200	166	200	178	188	154	200	168 180	188	146	176	138	164	174	162	174	164	170
H21	12	1	162	122	148	128	132	114	126	108	126	104	154	152	186	188	180	200	164	130

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H22	12	1	192	128	150	136	126	150	112	144	122	136	136	122	200	160	188	194	190	190
H23	13	1	194	200	196	160	162	156	184	168	148	148	200	156	200	200	200	200	200	200
H24	13	1	144	128	132	150	96	114	132	148	102	116	136	134	142	162	114	130	112	144
H25	13	1	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
H26	13	1	132	110	132	98	126	116	128	118	100	128	122	122	120	152	200	164	166	170
H27	13	1	162	126	110	130	92	106	150	118	112	116	94	132	92	80	68	74	60	92
H28	14	2	180	188	142	150	102	156	138	138	164	142	140	118	192	110	130	102	88	108
H29	14	1	118	134	118	104	116	128	116	116	108	132	114	112	138	126	126	136	104	114
H30	14	1	184	152	134	160	134	168	126	150	136	160	190	152	200	198	200	200	142	144
H31	14	1	200	200	200	200	196	200	200	200	200	200	200	200	200	200	200	200	200	200
H32	14	1	146	134	112	80	94	140	84	66	94	110	100	98	76	120	186	200	92	104
H33	14	1	200	184	196	190	200	196	164	194	186	200	194	156	184	136	164	152	120	136
H34	14	1	136	152	144	144	182	174	198	196	160	160	138	152	102	116	104	112	164	160
H35	14	2	200	200	200	200	200	200	200	200	200	200	200	200	200	194	200	200	182	186
H36	14	2	180	188	142	150	102	156	138	138	164	142	140	118	192	110	130	102	88	108

CON	BL-L	BL-R	GB-L	GB-R	ST-L	ST-R	LOW	MEDI	HIGH	YIN	YANG	PIE	EI	ES	U_L	L_R	Y_Y
H1	98	76	80	110	102	86	89	103	117	108	99	68	103	87	8	0	7
H2	132	132	120	122	110	110	108	124	140	131	118	73	124	78	4	8	9
H3	124	120	144	150	164	158	113	129	145	128	132	61	129	78	15	8	2
H4	142	138	160	160	148	164	118	134	150	135	134	58	134	77	22	1	0
H5	116	116	134	112	130	140	115	131	147	130	133	59	131	78	15	0	1
H6	136	150	128	144	140	164	126	143	160	145	142	66	143	84	2	4	2
H7	62	92	86	90	88	76	74	87	100	87	89	76	87	80	9	7	2
H8	148	144	168	164	190	186	140	158	174	158	157	72	157	94	10	2	0
H9	136	130	124	98	138	110	110	126	142	123	130	74	129	82	13	1	4
H10	182	200	200	200	200	200	174	194	200	194	195	88	194	100	4	4	0
H11	186	150	166	168	178	172	137	154	171	149	160	69	154	86	0	6	7
H12	184	192	182	182	200	200	156	174	192	176	173	80	174	95	11	0	1
H13	134	144	138	122	130	138	113	129	145	129	130	81	129	90	9	0	0
H14	172	200	200	200	200	200	164	184	200	192	177	67	184	94	13	7	7
H15	98	120	110	130	100	142	95	110	125	108	112	73	110	75	6	3	3
H16	128	150	136	122	146	120	114	130	150	127	135	72	130	84	3	3	5
H17	132	124	102	128	112	128	95	110	125	105	114	68	110	82	12	9	7
H18	158	166	174	176	180	198	142	159	176	153	165	59	159	62	4	2	7
H19	116	112	100	122	128	152	98	113	128	114	113	72	113	79	9	8	0
H20	158	160	164	168	192	184	154	172	190	175	170	67	172	94	3	8	2
H21	162	136	182	172	170	200	134	151	168	155	149	42	151	74	23	7	3
H22	174	192	200	200	180	198	146	163	180	167	160	39	163	80	27	1	4
H23	200	200	200	200	200	200	166	186	200	189	184	75	186	100	13	4	2
H24	122	182	148	162	156	148	119	135	151	131	141	57	136	77	11	10	6

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H25	200	200	200	200	200	200	179	199	200	200	200	92	199	100	0	0	0
H26	182	180	178	160	190	190	128	145	162	200	150	44	145	70	30	3	6
H27	76	90	84	96	100	102	88	102	116	99	106	59	102	64	29	4	6
H28	92	136	120	132	164	164	121	137	153	137	137	44	137	68	12	0	0
H29	114	118	114	122	126	164	106	121	136	122	121	85	121	88	5	6	0
H30	188	200	182	200	180	198	152	169	186	168	172	49	169	88	17	4	2
H31	176	200	200	200	192	200	178	198	200	200	197	88	198	100	1	1	1
H32	98	124	112	98	116	144	98	113	128	124	104	44	113	49	14	7	16
H33	124	142	110	144	144	148	148	165	182	172	159	41	165	79	24	0	7
H34	136	132	116	160	120	182	130	147	164	141	154	52	147	74	17	7	8
H35	200	198	196	200	190	200	177	197	200	197	199	92	197	100	2	0	0
H36	92	136	120	132	164	164	121	137	153	137	137	44	137	68	12	0	0

ONGC RAW DATA

Pre	Age	Gen	LUL	LU-R	PC-L	PC-R	HT-L	HT-R	SI-L	SI-R	TE-L	TE-R	LI-L	LI-R	SP-L	SP-R	LR-L	LR-R	KI-L	KI-R
O1	55	1	26	34	32	32	32	26	28	28	40	30	36	48	24	18	24	20	30	30
O2	51	1	60	36	56	58	62	40	68	40	52	26	50	46	28	32	18	16	20	26
O3	60	1	38	46	38	36	70	26	32	44	26	24	36	26	34	30	14	26	16	30
O4	55	1	58	56	52	50	44	28	38	36	66	46	50	46	12	24	30	26	12	14
O5	58	1	28	20	16	26	16	8	12	12	14	20	24	18	14	14	24	12	8	12
O6	54	1	22	28	28	24	24	18	16	26	16	32	32	24	14	12	26	20	26	24
O7	59	1	24	26	34	28	38	26	30	32	28	26	52	36	22	24	18	36	24	20
O8	54	1	14	18	22	16	12	12	12	26	14	24	22	12	14	8	8	6	12	6
O9	58	1	16	12	14	8	8	12	8	12	8	36	18	14	20	14	18	14	12	20
O10	51	1	38	30	26	32	38	26	24	30	32	30	30	28	20	14	26	18	22	24
O11	51	1	28	24	30	20	14	12	18	24	16	16	24	28	24	14	22	22	30	14
O12	59	1	20	24	18	14	22	16	26	16	14	20	26	16	28	14	20	16	30	42
O13	58	1	30	18	32	28	28	22	44	28	28	6	52	40	8	12	22	20	18	16
O14	54	1	16	16	18	24	18	18	22	16	10	18	18	20	26	10	22	20	18	12
O15	37	1	28	20	32	22	26	26	34	24	24	30	26	18	22	26	30	24	28	12
O16	59	1	46	36	22	20	44	30	40	36	38	24	40	32	44	34	38	46	46	34
O17	53	1	38	38	34	34	36	36	46	30	30	32	30	28	14	10	12	12	24	26
O18	58	1	22	22	40	24	30	28	34	38	30	26	40	40	20	14	20	20	32	20
O19	56	1	10	10	8	14	8	8	10	10	14	14	8	20	12	16	8	8	8	10
O20	53	1	28	22	26	24	24	18	24	32	20	18	24	24	12	8	14	10	20	16
O21	52	1	34	32	32	30	28	30	30	34	20	34	36	28	18	28	42	24	30	20
O22	57	1	28	18	26	20	30	18	20	24	22	20	36	30	6	12	14	20	8	14
O23	55	1	14	12	14	14	12	8	20	6	8	14	18	14	30	12	12	8	8	14
O24	60	1	36	24	36	36	24	22	26	24	38	28	44	44	34	16	28	40	12	24
O25	58	1	36	24	20	12	14	6	20	18	18	20	30	20	22	14	18	24	30	12
O26	50	1	48	52	36	16	56	22	42	38	40	18	40	38	30	40	34	34	42	16
O27	55	1	26	30	46	20	24	22	32	32	30	30	32	30	32	28	38	74	32	40

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O28	53	1	26	14	18	14	10	12	12	20	22	10	18	12	14	14	18	16	8	18
O29	57	1	16	18	20	22	16	18	18	14	18	20	22	30	20	18	20	30	20	32
O30	49	1	56	28	46	32	78	30	40	46	48	30	48	34	68	42	58	48	54	52
O31	59	1	20	20	24	12	28	16	12	16	12	16	18	18	6	12	10	12	14	10
O32	50	1	26	18	20	16	22	24	32	22	26	20	24	22	24	34	32	22	26	26
O33	47	1	52	40	40	30	32	30	42	46	44	36	28	28	42	44	12	16	12	14
O34	52	1	42	44	48	36	38	46	38	44	38	38	42	54	40	20	52	28	36	34
O35	59	1	36	22	20	20	20	16	22	40	26	14	30	26	14	22	28	30	48	34
O36	54	1	26	12	22	16	12	16	8	14	6	12	22	18	6	6	10	8	128	14
O37	52	1	32	18	36	34	34	24	28	26	28	26	36	30	18	14	30	18	26	18
O38	59	1	10	12	22	8	8	22	14	18	12	10	26	8	12	8	14	8	30	32
O39	51	1	18	18	26	16	26	20	18	24	18	10	24	18	24	20	26	26	44	34
O40	52	2	32	14	26	16	24	20	42	20	30	18	32	26	26	28	42	50	40	28
O41	57	2	32	26	22	22	24	12	26	26	28	24	20	24	14	32	28	28	38	22
O42	50	2	14	24	22	18	20	16	20	16	14	14	24	18	8	12	16	14	6	6
O43	56	2	40	36	24	24	32	26	36	26	26	26	34	38	22	18	20	20	16	14
O44	50	2	44	34	16	18	20	14	8	18	14	14	12	24	12	20	18	20	12	14
O45	55	2	18	12	20	18	8	14	16	18	8	16	28	16	30	14	18	14	14	14

Appendices

Pre	BL-L	BL-R	GB-L	GB-R	ST-L	ST-R	LOW	MEDI	HIGH	YIN	YANG	PIE	E_L	E_S	U_L	L_R	Y_Y
O1	38	40	48	30	28	36	16	31	46	27	36	84	31	89	6	3	23
O2	8	12	32	30	36	26	21	36	51	38	36	55	36	75	52	20	5
O3	28	18	32	28	18	22	15	30	45	34	28	72	30	76	33	6	17
O4	14	24	18	30	18	26	19	34	49	34	34	68	34	78	56	1	1
O5	14	16	16	14	18	18	16	25	31	17	16	85	16	92	15	6	1
O6	26	24	20	30	28	30	8	23	38	22	25	91	23	93	3	4	12
O7	24	24	22	22	26	36	13	28	43	27	30	81	28	87	21	1	10
O8	6	12	6	10	12	10	0	13	28	12	14	83	13	91	46	3	10
O9	14	18	14	18	20	36	0	15	30	14	18	69	15	88	22	20	24
O10	24	18	24	22	16	28	10	25	40	26	26	83	25	91	29	6	2
O11	22	20	30	28	24	24	7	22	37	21	23	87	22	94	7	12	7
O12	26	36	36	32	30	28	8	23	38	22	26	80	23	89	31	7	13
O13	14	26	18	20	28	18	9	24	39	21	27	66	24	80	38	21	21
O14	18	20	14	26	18	24	3	18	33	18	19	91	18	94	6	2	2
O15	24	14	34	20	42	36	10	25	40	25	27	81	25	88	0	22	9
O16	36	50	36	58	54	80	25	40	55	37	44	70	40	76	26	0	16
O17	24	24	16	16	26	14	11	26	41	26	26	78	26	85	47	9	0
O18	28	28	34	34	40	34	14	29	44	24	34	84	29	91	13	11	28
O19	12	10	18	18	10	14	0	11	26	10	13	86	11	95	6	17	24
O20	20	16	18	14	24	28	18	34	5	20	35	84	20	90	23	1	20
O21	24	28	24	34	30	26	14	29	44	29	29	88	29	92	10	0	0
O22	8	28	12	14	8	22	4	19	34	18	20	80	19	87	43	9	12
O23	14	16	10	12	12	14	0	13	28	13	13	80	13	89	4	16	0
O24	14	14	20	14	28	18	11	26	41	28	26	76	26	87	31	10	6
O25	14	14	20	18	12	14	3	18	33	19	18	78	18	87	10	22	6
O26	50	48	30	28	26	24	20	35	50	36	35	66	35	85	9	21	0
O27	30	34	32	38	42	60	19	34	49	34	35	69	34	78	26	9	2
O28	22	16	18	20	26	12	1	16	31	15	17	85	16	93	6	16	12

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O29	22	16	18	36	28	26	6	21	36	21	22	79	21	92	18	15	6
O30	44	58	58	46	72	42	33	50	63	49	47	53	48	82	19	27	4
O31	8	14	14	10	12	16	0	14	29	15	14	83	14	90	34	3	9
O32	38	30	30	28	40	42	11	26	41	24	30	78	26	90	26	10	18
O33	12	14	12	14	58	22	17	32	47	33	32	68	32	81	36	14	3
O34	26	46	52	46	62	30	25	40	55	39	43	82	40	85	7	9	10
O35	20	28	36	28	54	48	13	28	43	27	31	78	28	84	27	9	13
O36	12	12	8	10	12	12	2	17	32	23	12	60	17	41	22	44	47
O37	26	40	20	22	18	26	11	26	41	25	27	80	26	90	21	10	7
O38	18	32	18	20	12	18	1	16	31	16	17	81	16	90	23	0	9
O39	42	24	26	24	22	34	9	25	39	25	24	73	24	86	31	14	4
O40	30	28	28	22	28	22	13	28	43	29	28	74	28	86	22	23	1
O41	22	12	26	30	42	46	10	25	40	25	27	85	25	86	13	8	9
O42	14	8	12	8	10	6	0	14	29	15	14	79	14	93	45	11	6
O43	28	32	22	26	24	22	11	26	41	24	28	83	26	90	28	4	14
O44	14	14	16	12	14	14	12	17	32	20	15	80	17	84	23	7	28
O45	14	22	14	20	12	16	11	16	31	16	17	91	16	91	4	3	3

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POST	LUL	LU-R	PC-L	PC-R	HT-L	HT-R	SI-L	SI-R	TE-L	TE-R	LI-L	LI-R	SP-L	SP-R	LR-L	LR-R	KI-L	KI-R
O1	26	16	30	36	16	28	16	30	28	32	32	46	32	30	42	34	18	22
O2	40	24	28	32	24	30	22	24	28	26	42	32	16	22	16	6	16	20
O3	20	30	32	30	36	30	42	30	26	18	34	24	30	12	20	16	10	12
O4	40	60	34	22	42	24	48	28	58	42	60	38	14	16	22	16	10	8
O5	24	18	24	24	18	14	18	20	14	14	20	16	28	18	30	20	20	30
O6	34	40	42	34	34	40	34	36	38	44	40	32	20	28	34	58	66	66
O7	24	20	34	34	36	28	30	58	30	32	40	24	32	30	34	58	24	26
O8	10	8	18	14	14	12	12	8	24	14	24	10	20	32	14	16	12	10
O9	16	14	22	28	10	14	16	36	16	20	20	18	32	18	10	12	16	16
O10	52	46	44	36	38	30	28	38	30	42	42	44	34	20	34	22	40	26
O11	54	44	34	20	22	20	34	32	28	22	32	22	26	18	22	22	38	34
O12	28	24	18	26	28	24	28	20	22	18	34	24	34	28	40	36	36	30
O13	26	22	30	36	24	26	30	28	28	8	30	38	12	20	20	24	12	24
O14	26	38	34	34	32	22	26	16	8	16	32	38	14	12	36	32	40	18
O15	62	42	54	30	50	36	50	40	50	34	44	32	24	24	34	36	36	38
O16	58	60	46	52	42	54	48	54	42	52	58	74	58	62	54	54	84	66
O17	116	112	72	66	94	58	96	86	56	92	132	86	18	18	20	16	20	58
O18	30	54	46	36	38	28	36	32	30	38	36	24	16	14	18	28	16	30
O19	26	30	42	30	38	42	30	36	40	28	48	60	30	16	36	18	16	18
O20	64	58	64	44	58	38	52	42	48	40	60	64	54	28	42	26	58	40
O21	62	48	30	36	38	46	42	36	46	42	54	38	32	38	48	46	26	30
O22	36	30	38	36	42	34	42	32	32	30	42	44	24	42	38	42	26	48
O23	14	20	26	18	20	8	18	18	18	18	32	24	20	26	18	36	18	32
O24	46	38	42	46	22	36	48	36	34	42	44	50	52	52	50	60	30	42
O25	48	38	52	30	54	34	36	38	42	36	54	36	42	46	48	62	48	34
O26	54	46	36	28	48	44	52	44	36	40	48	50	46	78	30	50	42	54
O27	48	30	68	38	52	36	62	42	60	48	62	60	38	56	72	80	42	90

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O28	38	26	30	16	22	22	16	26	20	14	34	24	22	22	28	14	18	14
O29	26	36	28	34	12	30	24	22	24	22	34	30	26	22	24	22	28	22
O30	66	44	74	38	64	46	26	46	36	38	28	34	52	46	40	32	50	52
O31	24	18	22	58	18	14	14	48	14	24	24	26	12	16	16	24	18	16
O32	54	42	34	32	34	32	40	34	38	28	36	30	40	44	56	16	44	50
O33	40	36	34	36	26	20	30	36	30	26	36	32	32	46	34	30	24	28
O34	48	40	46	42	34	50	52	44	42	40	48	44	38	56	68	60	56	40
O35	46	32	38	24	22	20	30	30	30	26	42	32	30	24	46	30	46	38
O36	34	28	32	22	14	22	12	14	16	24	28	22	14	14	20	26	14	16
O37	24	18	26	30	20	32	28	22	20	18	28	20	24	32	28	40	24	24
O38	8	14	12	20	14	16	14	14	12	8	16	14	20	16	18	14	24	24
O39	28	32	22	28	28	42	24	38	18	18	20	28	30	26	30	26	38	44
O40	26	14	30	10	16	20	18	16	18	16	24	26	32	30	34	42	26	24
O41	46	36	38	40	46	26	48	46	50	34	48	44	14	66	68	64	46	34
O42	26	16	22	24	22	22	20	14	14	18	28	24	14	12	12	6	8	8
O43	48	54	36	36	38	32	42	34	36	36	44	54	34	18	26	36	18	8
O44	34	40	24	18	20	18	8	22	32	22	26	18	32	16	54	18	16	16
O45	22	16	22	16	12	16	18	18	8	20	18	18	12	8	20	10	14	16

Appendices

Post	BL-L	BL-R	GB-L	GB-R	ST-L	ST-R	LOW	MEDI	HIGH	YIN	YANG	PIE	E_L	E_S	U_L	L_R	Y_Y
O1	38	38	54	34	24	38	15	30	45	28	34	79	30	85	16	7	19
O2	20	12	30	18	18	18	18	25	38	23	24	73	23	85	39	12	5
O3	18	34	34	26	20	22	10	25	40	23	27	75	25	87	27	11	15
O4	8	10	14	8	28	18	12	27	42	26	30	59	27	78	65	23	14
O5	34	34	38	26	26	30	8	23	38	22	24	79	23	91	32	10	7
O6	66	70	68	74	84	62	32	47	62	41	54	67	47	75	35	4	23
O7	32	48	36	46	30	58	20	35	50	32	39	69	35	86	14	17	18
O8	20	20	14	16	16	18	0	15	30	15	16	79	15	90	19	10	8
O9	14	14	20	24	20	20	3	18	33	17	20	86	18	89	6	9	12
O10	54	36	40	24	54	38	22	37	52	35	39	73	37	88	10	17	10
O11	28	46	16	26	28	44	14	29	44	30	30	84	29	85	4	3	1
O12	64	46	70	54	78	52	20	35	50	29	43	58	35	75	48	20	30
O13	14	28	24	16	30	20	8	23	38	23	25	81	23	88	25	3	6
O14	36	38	30	46	36	52	14	29	44	28	31	78	29	82	17	3	9
O15	58	30	94	70	48	62	29	44	59	39	51	63	44	71	5	21	23
O16	94	96	72	104	80	86	49	64	79	58	72	63	64	78	29	9	19
O17	20	32	20	48	24	42	43	58	73	56	61	30	58	50	68	3	8
O18	24	18	18	16	20	30	13	28	43	30	27	78	28	84	42	5	9
O19	24	12	14	18	18	12	13	28	43	29	28	71	28	80	48	11	0
O20	62	60	62	46	56	48	35	50	65	48	53	77	50	88	7	21	10
O21	40	44	42	36	52	40	26	41	56	40	43	88	41	88	8	6	6
O22	48	68	36	30	64	70	25	40	55	36	45	75	40	83	18	7	18
O23	22	30	18	16	18	20	6	21	36	21	21	86	21	89	14	9	1
O24	46	52	40	50	56	46	29	44	59	43	45	81	44	87	15	7	5
O25	84	34	44	50	52	56	30	45	60	45	47	68	45	79	17	18	4
O26	80	78	44	62	32	44	33	50	63	46	51	66	48	81	17	11	8
O27	64	56	62	62	94	114	44	59	74	54	66	53	59	66	26	1	17
O28	28	24	22	28	40	36	9	25	39	23	26	84	24	90	2	16	12
O29	22	24	16	28	26	22	10	25	40	26	25	88	25	90	12	7	5

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O30	30	54	38	58	64	40	30	45	60	50	41	71	45	82	2	7	18
O31	10	14	22	20	14	18	6	21	36	21	21	63	21	79	34	29	3
O32	48	48	52	62	50	56	26	41	56	40	44	76	41	83	23	9	8
O33	32	30	24	30	46	48	17	32	47	32	33	90	32	90	5	2	3
O34	36	70	90	92	86	62	38	53	68	48	59	64	53	78	29	0	18
O35	50	42	24	32	34	38	18	33	48	33	34	79	33	89	14	15	3
O36	20	20	22	16	30	18	5	20	35	21	20	88	20	92	14	5	5
O37	46	56	24	26	20	26	12	27	42	27	28	80	27	85	22	9	3
O38	26	26	20	16	14	22	1	16	31	17	17	83	16	93	32	2	0
O39	46	34	26	40	24	38	14	29	44	31	29	79	29	90	17	13	4
O40	30	30	24	34	30	32	10	25	40	25	25	80	25	87	36	4	1
O41	30	46	54	44	52	54	29	44	59	44	46	75	44	79	12	1	4
O42	12	14	8	6	16	8	0	15	30	16	15	79	15	91	50	14	5
O43	30	8	28	12	20	22	16	31	46	32	31	70	31	81	46	12	4
O44	14	10	14	16	32	16	17	22	37	26	19	76	22	80	9	24	24
O45	16	24	8	26	14	18	11	16	31	15	17	87	16	93	8	10	10

DEPRESSION RAW DATA																			
EX	Gen	LU_L	LU_R	PC_L	PC_R	HT_L	HT_R	SI_L	SI_R	TE_L	TE_R	LI_L	LI_R	SP_L	SP_R	LR_L	LR_R	KI_L	KI_R
D1	1	126	90	150	82	86	82	74	88	100	94	108	102	100	128	124	120	110	128
D2	1	126	126	170	80	104	90	48	82	90	148	158	172	88	186	60	80	76	74
D3	1	88	56	48	66	162	130	58	138	176	86	110	80	180	32	78	44	38	40
D4	1	142	102	112	62	134	66	62	162	84	142	94	102	50	84	24	28	50	40
D5	1	162	196	200	138	196	190	184	198	178	200	140	150	174	148	200	188	94	106
D6	2	74	80	88	106	90	122	82	86	96	86	60	78	64	80	84	84	68	74
D7	1	126	166	136	150	146	160	142	138	166	136	120	144	138	152	124	134	110	118
D8	2	88	76	98	96	72	98	98	96	80	72	102	80	70	32	90	76	14	16
D9	1	78	98	120	70	98	130	110	200	130	94	110	90	200	158	180	198	170	200
D10	1	52	48	78	62	118	114	80	68	62	78	50	50	54	28	142	32	18	54
D11	2	136	112	80	76	88	66	82	68	94	100	146	102	88	66	116	120	58	86
D12	1	96	68	62	110	76	90	72	82	92	96	94	72	76	52	78	62	48	52
D13	2	168	166	118	200	192	200	200	198	188	200	154	126	120	160	200	162	178	162
D14	1	92	98	74	82	66	100	78	88	72	90	74	82	122	96	128	92	108	108
D15	1	12	28	40	22	28	62	8	28	12	22	26	18	14	10	18	20	16	12
D16	1	122	112	116	102	114	120	88	108	108	130	78	104	74	182	96	150	124	76
D17	2	136	118	86	106	56	98	90	64	82	44	126	116	200	146	160	166	44	82
D18	1	106	110	66	74	80	98	62	70	64	66	20	138	48	40	54	44	22	18
D19	1	86	52	68	84	56	54	70	70	74	56	66	68	22	76	20	48	126	58
D20	2	96	80	124	120	108	132	104	88	114	102	116	96	94	56	82	66	86	76
D21	2	118	46	64	42	66	24	196	38	170	144	48	62	166	56	114	94	28	36
D22	2	134	160	118	122	120	116	104	112	110	138	122	134	102	90	102	112	58	102
D23	1	94	166	110	106	152	156	100	100	116	86	114	98	134	180	132	162	144	62
D24	2	106	74	90	84	76	76	84	114	58	84	116	92	184	170	162	130	94	78
D25	1	90	102	108	142	148	114	106	102	116	144	102	138	126	196	198	194	156	166
D26	2	162	86	144	108	80	98	74	168	88	144	104	120	132	100	192	172	178	130
D27	1	192	180	186	182	174	124	152	162	182	186	132	132	146	194	184	182	112	192

Appendices

EX	BL_L	BL_R	GB_L	GB_R	ST_L	ST_R	Low	Med	High	Yin	Yang	Fir	Earth	Met	Water	Wood	PIE	E_I	E_S	U_L	L_R	Y_Y
D1	110	86	112	126	118	138	92	107	122	111	105	94	121	106	108	120	59	107	78	15	4	5
D2	68	44	38	38	28	46	78	92	106	105	80	101	87	145	65	54	26	92	34	40	9	23
D3	46	40	48	30	70	42	66	78	90	80	70	108	81	83	41	50	15	78	36	42	28	3
D4	68	10	102	18	98	30	65	77	89	75	81	103	65	110	42	43	11	77	35	52	17	8
D5	92	146	152	140	180	178	146	163	180	166	162	185	170	162	109	170	46	163	70	15	1	2
D6	68	70	64	76	64	72	67	79	91	85	75	94	70	73	70	77	70	79	80	17	11	11
D7	116	110	114	94	118	124	116	132	148	138	127	146	133	139	113	116	59	132	83	16	4	8
D8	14	34	16	18	62	18	52	63	74	69	58	88	45	86	19	50	25	63	65	56	11	16
D9	152	136	176	172	200	200	127	144	161	142	148	118	189	94	164	181	27	144	56	38	1	3
D10	68	42	30	56	30	38	49	60	71	67	54	82	37	50	45	65	34	60	47	31	14	18
D11	60	84	108	98	152	104	81	95	109	91	100	81	102	124	72	110	57	95	67	0	10	8
D12	62	68	60	46	44	66	59	71	83	73	71	85	59	82	57	61	51	71	77	29	0	1
D13	176	106	200	178	178	200	154	172	190	169	175	186	164	153	155	185	54	172	78	4	0	3
D14	144	104	150	104	116	116	85	99	113	97	102	81	112	86	116	118	56	99	72	28	5	4
D15	14	20	20	30	16	28	13	21	29	24	20	27	17	21	15	22	51	21	76	28	25	14
D16	74	56	74	118	92	164	92	107	122	116	100	110	128	104	82	109	40	107	53	1	18	13
D17	72	62	92	98	74	126	87	101	115	117	87	78	136	124	65	129	29	101	37	15	0	25
D18	8	12	8	18	66	58	46	56	66	63	49	72	53	93	15	31	34	56	43	56	19	22
D19	76	78	90	88	48	60	55	66	77	63	70	66	51	68	84	61	59	66	56	1	1	11
D20	90	98	88	80	86	80	80	91	108	93	95	111	79	97	87	79	71	94	76	23	9	1
D21	56	40	36	50	66	98	65	77	89	71	84	93	96	68	40	73	15	77	25	17	35	14

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D22	70	104	106	116	134	160	99	114	129	111	118	117	121	137	83	109	62	114	66	15	12	5
D23	70	80	112	106	134	132	103	118	133	133	104	115	145	118	89	128	46	118	58	3	1	21
D24	96	170	138	110	168	116	96	111	126	110	112	83	159	97	109	135	36	111	53	34	5	1
D25	174	168	166	168	166	170	127	144	161	145	143	122	164	108	166	181	38	144	67	31	8	1
D26	118	126	92	144	104	86	107	122	137	132	114	113	105	118	138	150	30	122	59	12	0	13
D27	82	90	170	128	116	158	65	77	89	83	73	81	84	92	58	70	53	77	76	18	10	12

Appendices

CON	Gen	LU_L	LU_R	PC_L	PC_R	HT_L	HT_R	SI_L	SI_R	TE_L	TE_R	LI_L	LI_R	SP_L	SP_R	LR_L	LR_R	KI_L	KI_R
D1	2	78	58	54	44	38	36	50	42	50	50	68	68	42	48	42	26	44	40
D2	2	98	56	62	42	50	36	52	38	68	58	56	52	30	10	52	36	44	54
D3	2	134	128	114	90	74	94	98	76	110	96	76	70	56	50	62	84	50	80
D4	2	112	108	74	66	80	80	74	92	96	88	78	70	78	96	102	82	66	52
D5	2	70	62	66	66	70	68	72	76	70	64	26	52	64	74	74	70	88	102
D6	2	100	76	64	68	66	66	70	70	84	68	72	76	60	60	72	72	50	64
D7	2	86	84	68	76	72	74	80	76	80	88	72	70	70	62	100	96	76	64
D8	2	68	62	68	70	62	76	78	60	70	64	60	68	46	52	66	62	62	46
D9	2	80	76	100	88	80	88	80	88	82	88	86	86	70	54	78	74	60	30
D10	2	72	60	62	64	66	68	70	64	66	62	62	72	74	62	80	58	56	60
D11	2	70	70	68	50	66	66	76	70	72	74	72	62	46	44	46	46	34	28
D12	2	40	38	38	38	26	52	28	30	30	40	32	32	46	46	38	38	24	26
D13	2	70	68	68	62	68	68	66	60	72	76	72	66	72	74	78	74	64	48
D14	2	68	70	74	78	76	90	72	76	62	86	72	76	80	86	76	68	72	80
D15	2	82	86	68	86	68	80	72	78	66	94	70	86	118	82	88	72	64	76
D16	2	64	68	74	78	78	76	66	78	74	66	60	68	36	36	68	38	38	24
D17	1	28	38	50	32	52	58	60	34	48	32	60	28	64	62	56	36	26	48
D18	1	60	64	46	48	34	34	42	42	62	40	62	40	68	30	62	44	26	36
D19	1	88	62	64	46	40	54	54	78	54	58	82	38	124	68	78	108	74	86
D20	1	50	68	70	76	72	86	94	94	74	80	86	78	50	66	72	66	80	72
D21	1	92	66	80	92	98	76	104	92	94	132	80	90	44	72	64	68	62	76
D22	1	96	84	120	122	92	98	90	86	78	78	86	102	80	104	114	114	76	122
D23	1	78	86	74	72	80	94	92	94	70	78	66	82	96	86	116	94	70	68
D24	1	72	64	64	46	48	64	54	24	48	36	50	54	52	44	58	62	48	32
D25	1	82	80	64	64	80	78	78	74	82	76	62	66	38	34	40	30	36	30
D26	1	68	66	70	74	72	76	74	64	74	76	74	74	78	70	102	92	60	54

Appendices

D27	1	84	62	58	50	62	78	50	44	56	52	48	56	48	50	54	44	36	46
D28	1	84	82	74	84	72	68	86	80	80	72	86	76	90	98	70	108	82	64
D29	1	58	68	60	68	62	70	64	62	64	64	66	68	102	66	68	66	70	68
D30	1	92	74	80	88	74	78	80	82	76	76	70	98	106	72	124	86	56	50
D31	1	94	80	80	74	70	70	76	82	72	80	84	72	70	64	68	62	64	68
D32	1	74	56	60	62	70	72	62	64	64	66	62	64	64	50	66	52	58	54
D33	1	66	64	86	80	62	72	74	80	74	68	72	90	74	64	66	68	54	52
D34	1	74	80	64	70	64	116	70	82	58	82	60	66	62	66	66	76	80	72
D35	1	76	60	66	64	78	76	86	80	70	78	64	70	68	68	66	72	70	72
D36	1	66	72	60	66	56	64	60	58	50	52	68	58	66	54	78	66	68	76
D37	1	62	74	74	86	76	66	76	90	66	62	64	76	70	84	84	66	72	68
D38	1	76	72	70	78	62	68	76	66	66	68	74	68	72	50	60	60	72	62
D39	1	70	74	52	56	56	56	60	64	62	64	62	72	68	50	62	44	44	56
D40	1	128	156	108	98	90	106	102	126	84	96	112	110	70	76	62	70	46	34
D41	1	86	84	76	82	66	84	70	76	74	76	80	76	64	64	62	78	62	50
D42	1	66	74	64	64	68	66	70	62	64	62	64	60	74	70	66	78	58	40
D43	1	68	68	64	80	72	78	78	70	66	68	72	70	72	58	58	52	52	46

Appendices

EX	BL_L	BL_R	GB_L	GB_R	ST_L	ST_R	Low	Med	High	Yin	Yang	Fir	Earth	Met	Water	Wood	PIE	E_L	E_S	U_L	L_R	Y_Y
D1	38	38	28	28	42	18	62	75	86	73	76	68	79	52	101	74	71	74	89	25	3	3
D2	30	60	46	46	40	58	56	68	80	68	69	69	64	81	61	65	78	68	85	13	1	0
D3	42	118	62	102	104	86	66	78	90	77	80	76	81	78	69	89	89	78	92	3	0	3
D4	68	48	56	40	104	60	49	60	71	62	60	68	52	64	46	63	75	60	88	19	1	3
D5	110	106	72	82	92	86	61	75	85	73	73	86	66	82	51	65	66	73	75	28	4	0
D6	58	72	58	72	52	64	54	65	76	65	66	65	65	66	62	68	88	65	97	0	8	1
D7	70	68	72	90	94	98	42	52	62	53	52	67	41	68	28	41	59	52	79	45	5	0
D8	42	36	58	66	54	58	27	35	43	38	34	35	42	35	28	37	78	35	91	1	11	9
D9	64	52	52	58	66	76	51	62	73	68	57	67	64	69	45	60	70	62	86	16	6	15
D10	72	62	76	58	64	62	63	75	87	77	74	76	82	71	72	73	90	75	97	1	7	2
D11	32	20	32	42	36	40	67	79	91	81	78	76	89	81	73	78	85	79	84	2	2	4
D12	24	38	34	40	42	36	45	55	65	57	54	73	46	65	33	39	52	55	81	44	6	5
D13	32	38	52	38	60	52	38	40	58	46	50	45	77	38	26	55	41	48	56	17	4	8
D14	66	72	70	78	80	82	35	44	53	47	43	40	50	56	35	46	65	44	85	3	11	7
D15	78	76	78	74	84	74	61	75	85	74	72	55	96	67	70	93	35	73	67	30	0	2
D16	36	34	24	26	66	46	56	71	86	69	73	80	61	70	63	70	71	71	83	16	4	5
D17	20	10	54	74	72	112	64	79	94	74	85	95	67	82	62	74	60	79	67	25	5	12
D18	40	38	44	36	56	48	89	103	117	102	106	95	99	92	120	121	63	103	82	16	8	3
D19	48	72	80	108	94	100	73	86	99	85	89	81	94	78	72	111	75	86	86	12	5	4
D20	60	40	86	56	78	50	37	46	55	55	39	47	44	60	34	45	46	46	82	20	11	29
D21	56	54	84	82	70	82	43	53	63	55	52	74	34	72	34	30	55	53	78	55	4	4
D22	140	142	132	126	86	126	61	75	85	74	73	72	76	70	62	86	81	73	86	4	5	0
D23	66	84	118	116	82	112	41	51	61	56	48	56	45	62	38	51	67	51	76	22	3	15

Appendices

D24	34	24	36	24	30	50	67	79	91	81	77	76	83	82	73	82	86	79	89	1	0	5
D25	38	34	24	28	32	34	57	69	81	69	71	64	80	65	72	73	70	69	88	14	9	2
D26	80	56	68	84	84	72	66	78	90	82	76	79	88	83	57	85	60	78	74	4	10	7
D27	22	50	54	54	38	46	60	72	84	72	73	75	68	82	65	68	86	72	93	13	2	1
D28	80	68	82	70	68	78	50	61	72	62	61	65	63	64	54	55	85	61	96	10	7	1
D29	84	66	94	66	88	64	57	69	81	67	72	74	69	73	59	69	85	69	91	11	0	6
D30	60	62	72	60	110	64	61	75	85	74	74	75	69	70	82	70	72	73	81	0	12	0
D31	68	60	64	80	74	66	59	71	83	70	74	74	72	67	71	70	91	71	97	1	0	5
D32	52	52	58	46	72	68	53	64	75	66	64	58	67	66	69	70	85	64	95	11	3	3
D33	70	60	72	70	72	66	61	75	85	74	74	74	74	69	73	77	89	73	96	3	1	1
D34	98	80	64	74	66	82	66	68	80	67	69	69	63	72	71	62	83	68	92	6	0	3
D35	64	78	74	70	78	74	47	58	69	57	59	58	59	69	48	54	81	58	93	13	3	2
D36	70	64	74	64	76	72	69	82	95	87	77	101	61	126	41	61	51	82	51	50	7	11
D37	82	72	76	84	80	64	58	70	82	72	70	75	66	81	60	66	80	70	92	17	4	1
D38	64	86	60	70	66	66	54	65	76	66	65	64	71	66	57	67	87	65	90	0	0	1
D39	48	46	48	62	52	66	52	63	74	64	63	71	63	69	46	58	75	63	89	21	1	1
D40	44	40	56	58	48	52	69	82	95	87	77	101	61	126	41	61	51	82	51	50	7	11
D41	62	66	62	64	68	68	58	70	82	72	70	75	66	81	60	66	80	70	92	17	4	1
D42	58	74	64	60	68	72	54	65	76	66	65	64	71	66	57	67	87	65	90	0	0	1
D43	48	40	60	62	60	64	52	63	74	64	63	71	63	69	46	58	75	63	89	21	1	1

PUBLICATIONS FROM THIS DOCTORAL WORK

1. Meenakshy KB, Alex Hankey, H R Nagendra Electrodermal Assessment of SMET Program for Business Executives-*Voice of Res.*2014;2(4),61-65
2. Meenakshy KB. Sharma B, Hankey A. Nagendra HR. An Electrodermal Study Comparing HIV Infected Children with Non Infected Children. *Res. React. Resol.* 2013; 1:4-8.
3. Meenakshy K.B. Hankey A. Nagendra H.R. Vedic Yajna performance reduces Qi imbalances. *Res React and Resol*, 2014; 2(8), 16-24.



ELECTRODERMAL ASSESSMENT OF SMET PROGRAM FOR BUSINESS EXECUTIVES

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Abstract

Yoga courses are becoming increasingly fashionable for large corporations and their business executives. No study has previously assessed and demonstrated Yoga's specialty, the ability to increase levels of subtle energy in course participants. This study evaluates the impact of a 5 day stress management programme (SMET) for managers as measured by AcuGraph3. Forty five volunteers (both female & male), employees from a large Indian corporation, aged between 30 and 50 years were selected for the study. A single group, pre-post assessment was applied and the subjects were assessed on day 1 (pre) and day 5 (post) of the intervention. AcuGraph 3 Digital Meridian Imaging system was applied to assess. Post energy levels were significantly improved compared to pre values after the SMET program for the subject ($p < 0.001$). The 5 days SMET intervention increased overall pranic energy in the main acupuncture meridian channels. The results begin to explain why yoga practice is clinically effective.

Keywords: SMET, LAYT, Acugraph, Jing-Well points, Pranic Energy Level

The opening up of the Indian economy through liberalization, privatization, globalization and natural thrust towards information technology has made managers lives increasingly demanding.¹ Challenges are multiplied when executives have to work in diverse cultural situations. Workforce diversity has not only adversely affected executives emotional stability, but also leadership behaviour and effectiveness. The need for executives who are emotionally stable under adverse circumstances is increasing.² India's increasingly recognized systems of traditional knowledge provide a simple, natural remedy for this situation. Yoga practices are increasingly popular, and many businesses take them seriously as a means of increasing employee well being, health and effectiveness, even in large corporations.³ Yoga explains its power to achieve these aims in terms of traditional sciences. The Yoga perspective is that consciousness has five main coverings or sheaths, the *panchakoshas*. The manager's emotional stability is identified as belonging to the third of these, at the level of mind, the *manomaya kosha*, disturbances in which can impact lower levels, the *pranmayakosha*, and the physical body, or *annamaya kosha*.⁴ Even a little Yoga practice can improve stability in the mind, particularly in the emotions that drive thoughts, and create problems for health. Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA) holds programs to reduce executive tension and improve emotional balance in managers.¹ The main program, Self-Management of Executive Tension (SMET)^{1,5} trains executives to eliminate the effects of stress and maintain positive emotional balance. Using principles derived from the Upanishads⁶, combined with modern and traditional stress management techniques, it trains executives to be self-sufficient in handling effects of professional stress. The effectiveness of these programs has been evaluated using various measures such as emotional competence.¹ These measures evaluate program efficacy in western terms, but they do not begin to explain

why the programs are so effective how they work. Recently, SVYASA has begun to measure the effect of its Yoga programs on the *pranamayokosha* by direct measurements of the level of pranic energy^{7,8}, as assessed by modern electronic instruments such as AcuGraph3⁹, and even Gas Discharge Visualization (GDV).¹⁰ Here we report increases in Pranic Energy in SMET program participants as assessed by AcuGraph3.

Self Management of Excessive Tension (Smet): SMET is a set of techniques and Yoga practices developed specifically for applications to business by SVYASA.^{1,5} It includes conceptual inputs in the fields of stress, executive growth, group dynamics, and stress physiology, as well as Yoga-based practices known as Cyclic Meditation⁵: *asana*s and instant relaxation, quick relaxation, and deep relaxation techniques. Cyclic Meditation uses an alternation of stimulation and relaxation procedures, where relaxation periods last longer than stimulation periods. The practice is based upon two principles, depth of perception, and expansion of awareness. This study evaluated pre-post changes in pranic energy in business managers, participating in a SMET program. The experimental hypothesis was that the SMET intervention would significantly enhance the managers pranic energy level.

Prana and Chi Electrodermal Assessment of Prana: SVYASA has been developing a program to evaluate pranic energy by measuring effects on conductivity at the end points of the acupuncture meridians.¹¹ Comparison of the ancient Chinese and Indian systems indicates that meridians in traditional Chinese medicine (TCM) correspond to Nadis in the Vedic system, channels through which the pranic energy is said to move.^{8,12} Traditionally, health is associated with strong energy and balance of energy between the various acu-meridians; imbalance in Chi energy flows is said to be due to blockages in meridians¹³, and to lead to pathology.^{13,14} TCM holds that the solution is to bring Chi back into balance.¹³ Studies have shown that Chi

can be increased strongly and balanced by practicing Qigong (China) or pranayama (India).¹⁵

Electrodermal measurements depend on measuring the electrical conductivity of specific acupuncture or energy points on the skin. The several hundred such points on the human body are generally located along the meridians described in TCM, each associated with specific functions in the body, and named for a particular organ. Such electrical conductivity measurements provide information about the balance of Chi between the meridians and are used to diagnose the condition of the corresponding organs. Treatment correspondingly aims to correct health problems by improving the flow and uniformity of distribution of Chi. Electrodermal screening has been described as an indispensable tool for measuring biologic energies that no 21st century physician should be without.¹⁶ Numerous factors complicate electrodermal readings and present challenges to studies of acupuncture point and meridian. Commercial electro-diagnostic devices are sometimes thought inadequate and that improved methods may be needed to pursue this research more rigorously.¹⁷

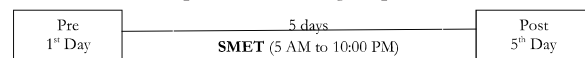
Despite this, electrodermal testing of acupuncture meridians has become popular in recent years due to ease of use of available instruments. One study using electrodermal measurements of weekend course participants suggested that the immediate effect of qigong practice improves balance of chi energy in the body, and correspondingly improves health.¹⁸

Acugraph: This study used the conveniently simple Acugraph3 Digital Meridian Imaging system, developed by Miridia Technologies in Meridian, Idaho, which has the following components: probe, ground bar, connector cable, software CD, user manual⁹, and computer. Readings are based on the 0-200 scale of Dr Nakatani's original system.¹⁹ It measures impedance with a voltage divider circuit comparing a known reference resistance, and gives transformed resistance at specific acupuncture points in normalized conductance (1/resistance) units; it works on very low voltages and currents (0-40 A), far below most people's threshold of sensitivity.⁹ An AcuGraph operator can take about one reading every 3 seconds, or about 10 measurements per minute. AcuGraph use is precluded for those with implanted electronic devices such as pacemakers or defibrillators. Its use is also to be avoided near skin rashes, lesions, or wounds. Every effort must be made to reduce variations. Major sources of variability include: the instrument itself (device, electrodes and skin probe interface); operators; and physiological variability of persons being measured. Operators must be properly trained to reduce errors in readings, but even so high variability from this source can remain.²⁰ Physiological variability can be reduced, to some extent, by keeping time of measurements fixed; averaging readings smoothes out fluctuations. With these provisos, Acugraph provides information about chi energy level in each meridian of potential importance in diagnosis. Chi energy in a particular meridian is considered normal if conductance values of both left and right meridians are within 10 points of the

overall average for the subject. If both values are more than ten points above the average, the meridian is considered to have excess energy, High, while if both values are more than ten points below it is considered deficient in energy, Low.⁹ If Left and Right values of a meridian fall on either side of either the High (+15 points), or Low (-15 points) energy levels, its energy is considered split. Acugraph presents a subjects meridians as a bar-graph, consisting of a pair of bars for each meridian. Each pair is coded in one of four colors: normal in green, high in red, low in blue, and split in pink, as these are considered important for individual diagnosis.⁹ The average energy for each subject is depicted by a middle line in green with the value given. The Acugraph software also calculates derivative variables: overall Yin Balance, Yang Balance, Personal Integral Energy (PIE), Energy Level (EL), Energy Stability (ES), Left /Right Balance (L_R), Upper/Lower Balance (U_L) Yin/Yang Balance (Y_Y). Electro-dermal screening of this kind is now increasingly popular throughout the world for diagnosis and to monitor efficacy of treatments. SVYASA selected Acugraph3 as a possible instrument to assess its Yoga programs. Reliability testing concluded that meridian color readings were not sufficiently reproducible for diagnostic accuracy, but that it could be used to assess groups.²¹ Here, we report changes in pranic energy levels in SMET course participants assessed using Acugraph3 measures on a limited number of acupuncture points the Jing-Well points at the end of each meridian, the easiest to locate.

Methods

Study Design: was a pre-post, self-as-control study, assessed on 1st (pre) and 5th (post) day of the intervention. There was no separate control group.



Subjects: consisted of 45 executives of both sexes (39 males, 6 females) middle and top class ONGC employees, age range from 30 to 50 years.

Inclusion Criteria

- Taking Self Management of Excessive Tension (SMET) program at SVYASA
- Willing to participate in the study
- Aged between 30 and 50 years.

Exclusion Criteria

- Any cut, scar or mole on the surface of Jing well points.
- Pregnancy or menstruation for ladies.
- Chronic, contagious, infectious disease, e.g. active tuberculosis, Hepatitis B or C, or HIV.
- Disseminated cancer, severe osteoporosis.
- Missing any finger or toe.

Intervention: was a 5 day residential SMET program, a Yoga lifestyle intervention consisting of intensive anti-stress Yoga training from 4:30 am to 9 pm, incorporating the following: specified times of rising and going to bed,



vegetarian diet; group meetings and Yoga practices: yoga *asana* (yoga postures), *pranayama* (breathing techniques), relaxation techniques, stress management techniques, meditation, Yoga purification practices (*kriyas*), *bhajans* (singing), lectures, and yogic games.

Assessment: was done on 1st day and 5th day of the training program using the Acugraph3

Digital Meridian Imaging system measuring skin conductance at acumeridian end points.

Procedure for AcuGraph measurements:⁹ Subjects sit comfortably on a chair, feet on a mat, and are first asked for personal information, which is entered in Acugraph soft: First / Last Name, ID number, age, gender etc. The subject's hands are checked for excessive wetness or dryness, which is adjusted using a towel or damp cotton ball (used to improve the conductivity of the electrical probe) applied to each acupuncture point. The subject then holds a ground bar with a medium grip in one hand, while successive acupoints on the opposite side (Jing Well point at the extremities of acupuncture meridians on the hands and feet), are measured in the order which the computer specifies, and for which it records readings at the specified left and right measuring points on all major acupuncture meridians; 6 on each hand and 6 on each foot, corresponding to the left and right meridians for the 12 major organs in the body: Lung, Pericardium, Heart, Small Intestine, Triple Warmer, and Large Intestine, (Hand) and Spleen, Liver, Kidney, Bladder, Gall Bladder, and Stomach (Foot). Care was taken to collect pre post data for each subject at exactly the same time of day from 9:30 am to 1:00 pm by a trained and skilled operator not involved in design or intervention, who managed pressure points, and location and alignment at the Jing-Well points.

Data Analysis: SPSS 19 statistical software was used to analyze the data. One Sample t-tests were used for each meridian.

Results

Results are given in Table 1. In the pre-data, mean energy level was very low, 24.38 ± 8.24 , but much of the variance was due to upper-lower imbalance of 22.62 ± 14.30 . The average for the upper meridians was 26.0 ± 11.24 , while that for the lower meridians was 23.51 ± 12.35 . This shows that the executives' normal energy levels were very low.

Comparing the pre data with the post data showed general improvements in the overall values of meridian energy. Only two meridians did not improve significantly on average, KL_L ($p = 0.277$) and HT_L ($p = 0.090$), though the latter showed a good trend. All other meridians improved in energy with $p < 0.05$, confirming previous findings that low pranic energy levels are rectified by IAYT Yoga lifestyle intervention.^{7, 22, 23} With regard to the average variables, overall energy level EL improved, and its components of Yin meridian mean energy and Yang meridian mean energy also did so.

A striking feature of these results is the extremely low average energy level of 24.38, EL. The same operator

previously obtained a mean energy level of 86.05 for a group of 37 diabetics.²⁰ Normally, pathology tends to decrease EL values, but here, despite being apparently healthy, subjects had overall energy levels only 28% of the diabetic patients. The operator (MKB) also reported that, when taking the pre-data, the low energy levels made many readings hard to obtain; even achieving initial electrical contact at an acupoints presented a challenge. The low EL value presented a contrast, however, to the number of balanced meridians: The subjects had an average of 10.96 out of 12 meridians in balance in the pre data, remaining much the same at 10.71 in the post data. In contrast, the group of diabetics averaged many more meridians out of balance. So in balance out of balance appears to be a more reliable estimate of pathology, as the manual suggests.

Table 1 - 5-Day SMET Program Results

VARIABLE		MEAN \pm SD	Change	t'	p Values
LU_L	PRE	30.04 \pm 12.70	8.22	3.33	0.00176
	POST	38.27 \pm 19.12			
LU_R	PRE	25.29 \pm 11.05	9.20	3.91	0.00031
	POST	34.49 \pm 18.03			
PC_L	PRE	28.00 \pm 10.76	7.78	3.71	0.00057
	POST	35.78 \pm 14.03			
PC_R	PRE	23.42 \pm 10.15	8.13	4.31	0.00008
	POST	31.56 \pm 11.12			
HT_L	PRE	27.42 \pm 15.81	4.40	1.73	0.090
	POST	31.82 \pm 16.52			
HT_R	PRE	20.89 \pm 8.54	8.36	5.74	8×10^{-7}
	POST	29.24 \pm 11.61			
SI_L	PRE	26.40 \pm 12.65	6.04	2.69	0.00999
	POST	32.44 \pm 16.60			
SI_R	PRE	26.00 \pm 10.26	6.53	3.23	0.00234
	POST	32.53 \pm 14.02			
TE_L	PRE	24.76 \pm 12.91	5.69	2.99	0.00459
	POST	30.44 \pm 13.29			
TE_R	PRE	22.58 \pm 8.67	6.76	3.74	0.00053
	POST	29.33 \pm 14.66			
LI_L	PRE	30.27 \pm 10.69	8.80	3.03	0.00402
	POST	39.07 \pm 18.52			
LI_R	PRE	26.93 \pm 10.71	7.91	3.47	0.00117
	POST	34.84 \pm 16.18			
SP_L	PRE	21.87 \pm 11.85	6.49	3.95	0.00027
	POST	28.36 \pm 11.97			
SP_R	PRE	19.47 \pm 9.66	10.00	4.98	0.00001
	POST	29.29 \pm 16.37			
LR_L	PRE	23.38 \pm 11.10	10.04	5.20	4×10^{-7}
	POST	33.42 \pm 15.43			
LR_R	PRE	22.76 \pm 13.08	9.16	4.50	0.00005
	POST	31.91 \pm 17.67			
KI_L	PRE	26.00 \pm 19.78	3.60	1.10	0.277
	POST	29.60 \pm 16.74			
KI_R	PRE	21.42 \pm 10.15	10.00	4.21	0.00012
	POST	31.02 \pm 17.54			
BL_L	PRE	21.91 \pm 10.14	14.49	5.35	0.0000029
	POST	36.40 \pm 20.60			
BL_R	PRE	23.96 \pm 11.67	12.89	5.47	0.0000020
	POST	36.84 \pm 20.04			
GB_L	PRE	23.60 \pm 11.27	11.29	4.36	0.000077
	POST	34.89 \pm 21.01			
GB_R	PRE	24.00 \pm 10.55	12.27	4.67	0.000028
	POST	36.27 \pm 21.89			
ST_L	PRE	27.11 \pm 15.15	11.07	3.95	0.00028
	POST	38.18 \pm 21.85			
ST_R	PRE	26.67 \pm 13.76	11.87	5.08	0.0000073
	POST	38.53 \pm 21.13			



VARIABLE		MEAN ±SD	Change	t'	p Values
LOW	PRE	10.67±7.71	+8.00	5.46	0.0000020
	POST	18.67±12.18			
MEDIUM	PRE	24.96±8.36	+8.15	5.47	0.0000020
	POST	33.11±12.63			
HIGH	PRE	38.71±9.69	+9.29	4.99	0.000010
	POST	48.00±12.62			
YIN	PRE	24.29±8.24	+7.8	5.44	0.0000020
	POST	32.09±11.48			
YANG	PRE	25.73±8.81	+9.29	5.55	0.0000015
	POST	35.02±14.30			
PIE	PRE	77.93±8.85	-3.46	1.71	0.095
	POST	74.47 ±11.16			
EL	PRE	24.38±8.24	+8.62	5.59	0.0000013
	POST	33.00±12.62			
ES	PRE	86.24±8.61	-2.68	1.55	0.127
	POST	83.56±7.87			
U_L_BAL	PRE	22.62±14.30	+0.45	0.19	0.852
	POST	23.07±16.33			
L_R_BAL	PRE	10.80±8.85	-0.64	0.36	0.720
	POST	10.16±6.91			
YIN/YANG	PRE	10.53±9.65	-0.86	0.52	0.603
	POST	9.67±7.40			

Table 1: Pre-post changes in Acugraph parameters over a 5 day SMET program. The program significantly improved overall chi energy, but the data show exceptionally low readings. Most pre readings are below 30, one below 20. Other studies have found low energy levels in people working in stressful jobs, as here. Personal Integrated Energy (PIE), Chi energy stability (CES), Upper Lower Balance (ULB), Left Right Balance (LRB), Yin/Yang Balance did not change significantly.

Discussion

Low energy levels indicate strain, and suggest susceptibility to disease. It is well known that pressurized work environments make employees disease prone and this data tends to corroborate that idea. In terms of pranic energy, one would say that the prana levels were low and that the pranamayakosha lacked resilience i.e. resistance to disease was compromised.

Despite low initial energy levels, the data upheld the experimental hypothesis that five days SMET program would increase energy levels: average increase was 8.77 ± 2.72 points, and post readings were correspondingly easier to obtain. At the end of the course, however, Energy Levels in most participants were still far lower than is desirable, suggesting that a longer intervention is needed for modern executives. The uniform increases observed over a range of initial values support this idea. Longer interventions might also show significant changes in the various combination variables that did not reach significance.

The strength of the study was that changes in individual meridian averages and overall Energy Level attained excellent p values. This was also seen in a previous study.⁹ ²² we can therefore be certain that these results are reliable, and will repeat for similar courses / interventions in future. The weakness of the study was the short duration of the intervention, which, though usual for business courses, is shorter than SVYASAs normal medical IAYT Yoga life-style programs. Dependence of increases in energy level on different intervention durations needs to be investigated.

Similar studies have obtained related results: measures of Chinese practices also indicate increased chi energy. Sancier¹⁵

¹⁸ found increased levels of Chi following a weekend Qigong workshop. Another study of Tai Chi²⁴, showed greater reduction in salivary cortisol and improvement in mood than meditation and brisk walking Tai Chi involves slow body movements providing moderate aerobic exercise, but does not involve supine rest alternated with slow body movements as does cyclic meditation used in SMET.

The natural question is how Yoga achieves the observed increases. One hypothesis is that it does so directly, because Yoga practices aim to increase levels of pranic energy^{7,11} i.e. chi in the meridians. However, it could also be because energy consumption tends to be decreased by Yoga practices, and practitioners physiology tends to function more economically, and should have energy to spare. This seems to happen in Tai Chi. Lan²⁵ found reduction in subjects oxygen consumption when breathing through an open circuit apparatus while practising Tai Chi.

A yoga study reported reduction in oxygen consumption (25.2%), and sympathetic activity after 10 minute practice of yoga-based guided relaxation in a supine posture.²⁶ Studies of Transcendental Meditation (TM) reported reductions in metabolic rate (and hence in need for oxygen) during TM reflected by an involuntary decrease in respiration rate and volume.²⁷ Greater reductions in oxygen consumption, respiratory rate, minute ventilation and tidal volume after CM²⁸, may have similar explanations. They suggest that the slow cyclic practice of yoga postures followed by rest in a supine posture induces deeper relaxation than supine rest alone. Indeed, the importance of alternating exercise with periods of rest has been independently described.²⁹ The yoga postures practiced in CM are physically activating compared to supine rest. One study of a guided relaxation technique combined with meditative stretching (body-mind training) found 31% reduction in electromyogram (EMG) of the frontalis muscle, and 22% reduction in state anxiety and fatigue³⁰, suggesting that meditative stretching combined with guided relaxation induces deeper muscular relaxation. Another showed that cyclic meditation⁵, where slow body movements with sustained attention produce calming and stimulating effects with emphasis on awareness, improves performance on the six letter cancellation test better than supine rest.³¹⁻³³

A study on effects of three different procedures, relaxation, visualization and yoga training, on perception of physical and mental energy and mood, demonstrated that relaxation and visualization made subjects sleepy and sluggish immediately after the practice, whereas the yoga training consisting of yogic stretch and breathing produced significantly greater increase in perception of mental and physical energy, feelings of alertness and enthusiasm.³⁴

Conclusion

Our findings are consistent with previous studies of AcuGraph³⁵, that although Acugraphs information on individuals is not sufficiently accurate, analysis of data from groups can reduce variance enough for the information generated to be scientifically useful.

Group results supported the hypothesis that Chi energy would increase, both in individual meridians and overall.



Persistent low energy levels suggested that employees with workplace stress should attend longer Yoga courses, however. Failure to achieve significant improvements in average variables other than overall Energy Level (EL) i.e. Personal Integrated Energy (PIE), Chi energy stability (CES), Upper Lower Balance (ULB), Left Right Balance (LRB), and Yin/Yang Balance, also support this conclusion.

Conflict of Interest Statement: no author has any conflict of interest to declare.

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AN ELECTRODERMAL STUDY COMPARING HIV INFECTED CHILDREN WITH NON INFECTED CHILDREN

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ABSTRACT

Context: Human immunodeficiency virus (HIV) infection is a widespread, stigmatized illness considered chronic and incurable, because it inevitably results in the fatal autoimmune deficiency syndrome (AIDS). Infection presents sufferers with many challenges, which may overwhelm their coping resources and impair psychological adjustment to the problems of managing their developing pathology. AIDS affects physical as well as emotional aspects of the patient's life, and any means of improving the quality of patients' lives is worthy of consideration.

Aims: This study evaluates electrodermal differences between HIV infected children and non-infected children, to evaluate the potential for Yoga practice to help their problems.

Methods and Material:

Study Design: A two group matched-control comparative study.

Subjects: 43 HIV affected children and (30 male, 13 female) and 36 normal healthy children (23 male, 13 female) all aged 7-15 years.

Assessment: Acu Graph 3 'Digital Meridian Imaging' system.

Results: Energy levels in HIV positive group were significantly lower in all meridians ($p < 0.001$).

Conclusions: Electrodermal conductance at acupuncture points is associated with level of health in terms of the Yoga concept of prana. The study suggests that HIV infection depletes the level of chi, and that Yoga practice may be helpful in restoring it and increasing the sense of well-being.

Key-words: HIV, Acugraph, Jing-Well points, Chi Energy Level

INTRODUCTION:

Autoimmune deficiency syndrome (AIDS) is a greatly feared, fatal condition, which is stigmatized and incurable. It is generally attributed to human immunodeficiency virus (HIV) infection, which is considered chronic and incurable, though it has been observed that life of a reasonable quality can often be extended by sagacious use of health giving practices from complementary and alternative medicine (CAM). Yoga is one such traditional CAM system, which has proved useful in improving quality of life in HIV infected individuals, even after the onset of early stage of AIDS. [1]

HIV infection bring great challenges to patients, and managing their developing pathology together with the psychological demands of adjusting to an infection considered inevitably fatal, may overwhelm their ability to cope with their condition. Improving patients' quality of life (QoL) then assumes a far greater level of importance. Improving QoL in cancer patients, often fatally ill, has been one of the most successful applications of Yoga medicine, and consequently the subject of some of its best funded research programs. [2]

There is also evidence that various meditation techniques can help improve the quality of life of HIV positive individuals. Qigong meditation, for example, has been hypothesized to be potentially helpful to HIV-infected individuals. [3] A more recent study, investigating possible benefits of Mindfulness Based Stress Reduction for HIV positive persons, found significantly improved natural killer cell activity and number. It suggested that mindfulness meditation, through stress reduction, may have the potential to strengthen the immune system in individuals infected with HIV. [4]

Yoga Medicine presents a variety of programs that can be adapted to those with HIV. General evaluations of these programs have recently been extended to electrodermal evaluations of Yoga Lifestyle programs for improving levels of health and QoL. These studies have shown that QoL increases as conductance at acupuncture points improves [5]. We therefore decided to evaluate the potential of Yoga Medicine programs to improve the QoL of HIV positive children,

by conducting a comparative electrodermal study of groups of HIV positive and normal children of the same age with similar gender distributions using Acugraph3.

The Acugraph3 Digital Meridian Imaging system was developed by Miridia Technologies of Meridian, Idaho, and is simple and convenient to use. Its components included probe, to contact the acupuncture point, a ground bar to return the current at zero volts, and a connector cable, user manual ^[6] and software CD. Data is presented on Dr Nakatani's original 0-200 conductance unit scale. ^[7] Acugraph uses ultra-low currents (0-40 μ A), so subject's threshold of sensitivity is not exceeded. ^[6] Operators obtain readings every 6 seconds or so, i.e. 10 per minute, which the software shows as a bar graph on screen. Each subject's average conductance is depicted by a middle line and its value in green. Derivative variables are also calculated; overall Yin Balance, Yang Balance, Personal Integral Energy (PIE), and Energy Level (-E_L), Energy Stability (E_S), Left/Right Balance (L_R), Upper/Lower Balance (U_L), and Yin/Yang Balance (Y_Y).

Electrodermal measures should *not* be made on subjects with implanted devices (defibrillators or pacemakers). Nor should it be used near skin rashes, lesions, or wounds. All variances should be minimized. Major sources of variance include: the device, electrodes and skin surface; operators; and subjects' conventional electro-physiologies ^[8] (minimized by using fixed times to make measurements); and averaging readings to smooth fluctuations.

Electro-dermal screening is used in some CAM practices for diagnosis. Acugraph3 was selected by SVYASA to monitor Yoga programs. Meridian color readings were deemed insufficiently reliable to make accurate single diagnoses. It seemed that it could be used on groups however. ^[9] Here, we report the differences between electrodermal measurements at each meridian's Jing-Well point of HIV-infected and normal children.

SUBJECTS AND METHODS:

Study Design: Matched Group Design to study Acugraph characteristics of the pathology

Subjects: consisted of 4 HIV infected children of both sexes (30 males, 13 females) matched control group 36 (23 males, 13 females) aged 7 to 15 years.

Inclusion Criteria

- HIV infected children
- Willing to participate in the study
- Aged 7 to 16 years.

Exclusion Criteria

- Any cut, scar or mole on the surface of a Jing well point.
- Missing any finger or toe.

Assessment: single Acugraph3 readings of skin conductance at Jing-Well meridian end points.

PROCEDURE FOR ACUGRAPH3 MEASUREMENTS:

Acugraph soft personal information is first entered: Name(s), ID number, age, gender etc. With the subject sitting comfortably on a chair, feet on a mat, excess wetness or dryness is checked on their hands, and a towel or damp cotton ball used to adjust surface humidity and, if necessary improve the conductivity of the electrical probe when applied to each Jing-Well point. With the subject gripping (medium grip) the ground bar in one hand, successive 'Jing Well' points (at extremities of acupuncture meridians), are measured on the opposite side of the body as specified by the computer, which records readings on all major acupuncture meridians; 6 on each hand and 6 on each foot i.e. for all 12 major meridians: Lung, Pericardium, Heart, Small Intestine, Triple Warmer, and Large Intestine, (Hand) and Spleen, Liver, Kidney, Bladder, Gall Bladder, and Stomach (Foot).

DATA ANALYSIS:

SPSS 16 statistical software was used to analyse the data. Independent sample t-tests were used to assess significance of differences between group averages of observed conductance levels for each meridian.

RESULTS:

Results for individual meridians are summarized in Table 1, which presents group averages and standard deviations for each meridian for both groups of children, HIV and normal. As can be seen, the normal children had higher conductance values for every meridian, and independent 't' tests gave significant p values for every meridian except for the Triple Energizer Right (TE_R) ($p = 0.139$) and the Liver Right (LI_R) ($= 0.077$), the differences between HIV and normal for both of which were more than 12 points. Applying the sign test to all 24 meridians, the probability against the null hypothesis being correct is 2^{-24} , $p \ll 0.0001$, so we can reasonably state that *all* meridians on the HIV children showed lower readings than the normal children, despite two not reaching t test significance.

**TABLE 1:
INDIVIDUAL MERIDIAN DIFFERENCES
BETWEEN HIV POSITIVE AND NORMAL CHILDREN**

MERIDIAN	HIVCHILDREN Mean±SD	NORMAL CHILDREN Mean±SD	p-Value
LU-L	141.81±34.528	161.66±28.315	0.007
LU-R	121.86±38.176	149.71 ±34.804	0.001
PC-L	122.71±34.516	146.80±31.668	0.002
PC-R	118.29±34.303	139.26±35.843	0.011
HT-L	113.71±35.157	133.37±38.215	0.023
HT-R	117.76±40.483	141.66±39.214	0.011
SI-L	123.19±35.755	144.17±33.828	0.010
SI-R	117.24±35.434	140.91±37.631	0.006
TE-L	118.52±33.777	137.54±33.677	0.016
TE-R	122.29±36.247	134.86±37.351	0.140
LI-L	128.86±30.209	146.97±32.210	0.014
LI-R	125.19±36.913	138.86±28.439	0.071
SP-L	113.81±43.192	149.03±40.428	<0.001
SP-R	105.62±44.896	148.69±37.614	<0.001
LR-L	118.90±43.796	150.17±38.374	0.001
LR-R	114.10±47.534	152.74±40.392	<0.001

KI-L	106.81±38.875	134.74±42.454	0.004
KI-R	110.81±44.507	142.80±35.324	0.001
BL-L	104.14±36.025	142.46±36.760	<0.001
BL-R	108.57±37.534	149.89±35.993	<0.001
GB-L	116.05±34.909	147.37±38.741	<0.001
GB-R	115.05±39.200	151.83±35.778	<0.001
ST-L	126.14±39.842	154.40±35.509	0.002
ST-R	120.14±41.020	161.89±36.458	<0.001

**TABLE 2:
GROUP MERIDIAN AVERAGES: DIFFERENCES
BETWEEN HIV POSITIVE AND NORMAL CHILDREN**

MERIDIAN AVERAGE	HIV CHILDREN Mean±SD	NORMAL CHILDREN Mean±SD	p-Value
LOW	102.50±31.221	128.71±28.612	<0.001
MEDI	117.50±31.221	145.49±30.416	<0.001
HIGH	132.24±30.586	160.09±28.632	<0.001
YIN	117.31±33.039	147.69±32.505	<0.001
YANG	118.74±29.702	146.03±30.200	<0.001
PIE	58.24±14.948	65.89±15.103	0.029
EI	117.50±31.221	145.57±30.342	<0.001
ES	73.88±12.665	82.57±11.942	0.003
U_L	16.17±12.857	11.34±8.331	.051
L_R	6.88±5.366	3.86±3.219	.003
Y_Y	5.05±4.096	3.63±3.614	.111

DISCUSSION:

Results show clearly that electro dermal conductance at the Jing-Well acupuncture points is lower in HIV infected children than in normal children, as the study hypothesis proposed. This is not in itself surprising. The ongoing challenge presented by the presence of a chronic infection, as well as the effect of a weakened immune system, would be expected to deplete levels of chi, the internal sense of vitality associated with optimized levels of electrodermal conductance, and thus to lower AcuGraph3 measurements. Results are therefore consistent with HIV infected children having lower levels of chi, and this being one reason for lowered sense of well-being and quality of life.

Previous studies have consistently shown that the effect of Yoga programs is first to improve levels of electrodermal skin conductance at acupuncture points, conventionally interpreted as improving levels of chi energy in the associated acupuncture meridians, and second to improve levels of balance between different regions of the body and between different meridians. Such effects have been seen in participants in qigong training courses in normal, healthy students coming for one month Yoga training courses particularly when compared to those with six months or more experience and also in business executives coming for five day Yoga training courses. Interesting secondary effects have also been seen, such as indications of improved regulation and restoration of depleted energy levels of ladies relative to men.

These studies suggest that Yoga practice would, to some extent, also increase depleted levels of chi in HIV positive children. The implications of this are that, by virtue of its power to restore chi levels, Yoga practice may be helpful in increasing the sense of well-being in HIV infected children, and materially contribute to their quality of life.

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VEDIC YAJÑA PERFORMANCE REDUCES QI IMBALANCES

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ABSTRACT

Background: Vedic culture emphasized both mantra and brahmana aspects of Veda. The latter concern yajñas, rituals used for betterment of society, and to elevate individual and environment by increasing subtle energy levels. Yajñas offer oblations to ‘devatas’ described in Veda. Here we report measurements of subtle energies of those performing yajñas over a period of one month using AcuGraph3 Digital Meridian Imaging System.

Aim: To investigate effect of performing various yajñas on AcuGraph3 readings.

Methods:

Study Design: Single group pre-post design.

Subjects: 15 residential SVYASA students aged 20 to 28

Informed consent: obtained from all subjects.

Ethical Approval: obtained from the institutional review board.

Assessment: AcuGraph3 measures at participants’ Jing-Well Point pre-post every yajña.

Statistical Analysis: used SPSS 19 statistical software to analyze the data –paired sample t-tests for all meridians and meridian groupings.

Results: Lower meridians systematically improved, upper meridians did not. Initial Upper-Lower imbalances were reversed.

Discussion and Conclusions: This study observed selective improvement in lower meridian conductances, and elimination of upper-lower imbalances. We conclude that yajña performance has positive effects on human health. Further research should use subjects not previously exposed to yajñas, and also test observations that failed to attain significance in this study.

Keywords: AcuGraph3, Jing-Well Points, Qi, Prana, Energy Imbalance,

INTRODUCTION

India’s ancient Vedic civilization was based on the knowledge cognized by its ancient seers or ‘Rishis’, whose cognitions included the Vedas (Wilson, 1857), accounts of the laws of nature from a subjective perspective, and how to use them in daily life to improve the life of society. The Vedic culture clearly distinguished between gross levels of ‘manifest’ reality (Yogi, 1971), open to ordinary sense perception, and subtle levels of reality (Radhakrishnan, 1992) that are only open to perception through refined senses, able to perceive subtle levels of energy etc. Since subtle levels were held to control the gross levels (Singh, 1979), this distinction means that the methods advocated by the Vedic sciences are potentially much more powerful than those promulgated by modern western science, which limits itself to phenomena open to the ordinary senses.

The Vedas consist of two portions, ‘Mantra’ and ‘Brahmana’. The former consist of *mantras* (cognitions) grouped in *suktas* (sets of cognitions) for recitation under various circumstances, while the latter concern Yajñas (Harshananda, 2013), rituals performed to raise levels of subtle energy in both individual and environment, and thus increase levels of spiritual attainment.

Yajñas are among the most powerful technologies promoted by the Vedic sciences. They consist of the chanting of Vedic mantras, during which offerings are made to a particular deity through the medium of a sacred fire. Homas are particular classes of Yajña, where oblations of ghee (clarified butter) and other offerings are made to devatas, spiritual aspects of the cosmos, as described in detail in the Brahmana portions of Veda, and in the Vedangas, the ‘limbs of the Veda’.

In teaching traditional Indian spirituality in S-VYASA’s Division of Yoga and Spirituality, effects of yajña performance have been measured by various means. (Devi, 2004; Rawat, 2007; Thakur, 2012) Here we report the influence of yajña performance on the subtle human physiology as measured by the AcuGraph3 Digital Meridian Imaging System (Meridia Technologies, 2008), an instrument designed to assess levels of ‘Qi’ energy in different acupuncture meridians, by measuring conductance levels at the Jing-Well meridian endpoints. This is the first time electronic measurements have been made of acupuncture meridians in connection with yajñas. The experimental hypothesis was that, since performance of a yajña is held to improve both the individual and society, improvements connected to health would be observed between AcuGraph3 readings taken before yajña performance, and those taken afterward. This series of observations was conducted as part of a set of experiments investigating use of AcuGraph3 to measure subtle energy levels in groups of individuals, observations of high coefficients of variance (Mist, 2011; Sharma, 2014a), having led to doubts concerning its reliability for individual readings.

ACUGRAPH

Acugraph3 Digital Meridian Imaging system includes the following five components: (1) an electrically conducting ‘probe’ to make electrical contact with acupoints; (2) a ‘ground bar’ at zero volts held by the subject, connected by (3) a ‘connector cable’ to the monitoring computer, programmed through (4) a software CD, together with (5) the User Manual. (Meridia Technologies, 2008) Data is presented on a 0–200 conductance unit scale developed by Nakatani in Japan. (Nakatani, 1972) The instrument uses ultra-low, 0-40 μ A, currents so as not to exceed participants’ sensitivity thresholds. Experienced operators can obtain about 10 readings per minute, displayed when complete as an onscreen bar graph by the software. A green middle line display’s a person’s average conductance, with high (red) and low (blue) lines + or – 15 units on either side. Derivative variables are also calculated. AcuGraph3 is to be avoided for subjects with implanted electronic devices like pacemakers or defibrillators, and also for those with skin rashes, lesions, or wounds at acupoints (Meridia Technologies, 2008, Sharma, 2014a), though none of these applied in the present study.

METHODS

Study Design: Single group pre-post design

Subjects: The study population comprised 15 ‘Yoga and Spirituality’ MSc. students of both genders at S-VYASA.

Inclusion Criteria

Normal healthy subjects, male or female.

Age range from 20 to 28 years.

Willing to participate in the study

Exclusion Criteria

Any cut, scar or mole on the surface of Jing well meridian end points

Missing any finger or toe.

Menstruation for ladies.

Excess sweat

Assessments: Single readings of skin conductance at Jing-Well meridian endpoints were taken using the Acugraph3 Digital Meridian Imaging System directly before and after yajña performance, usually held during the same daily time period, 05.30 am to 08.00 am, in the same place. To reduce environment and measurement variations (Sharma, 2014b), all readings were taken by the same operator (the first author).

Measurement Procedure: the subject first sits comfortably on a chair, feet on a mat; then personal information is taken: First / Last Name, age, gender etc. and an ID number is assigned. Subjects' hands are checked for excess wetness or dryness, which are adjusted using a towel or damp cotton ball respectively, to make acupuncture point surface conductances more uniform. The subject then holds a ground bar in one hand with a medium grip, while successive acupuncture points are measured on the opposite side in the order specified by the computer: on each hand, Lung, Pericardium, Heart, Small Intestine, Triple Warmer, and Large Intestine; and on each foot, Spleen, Liver, Kidney, Bladder, Gall Bladder, and Stomach.

Meridians: Lung (Lu_L, Lu_R), Pericardium (Pc_L, Pc_R), Heart (Ht_L, Ht_R), Small intestine (Si_L, Si_R), Triple warmer (Te_L, Te_R), Large intestine (Li_L, Li_R), Spleen (Sp_L, Sp_R), Liver (Lr_L, Lr_R), Kidney (Ki_L, Ki_R), Bladder (Bl_L, Bl_R), Gall Bladder (Gb_L, Gb_R), Stomach (St_L, St_R).

Meridian Groupings: the 16 groupings come in three sections: averages of selected meridians by body region etc. (Five); averages according to 'element' (Five); and important balance / imbalance sets (Six). Selections of meridians include, Low, Medium, High, Yin and Yang; 'Elements' are classified under, Wood, Metal, Fire, Water and Earth; Balance/Imbalance; Groupings comprise, Personal Integrated Energy (P.I.E.), an index of overall energetic status, Energy Level (mean of all 24 meridians); Energy Stability (E_S) (range divided by the mean); Upper-Lower Imbalance (U_L), mean of upper meridians minus mean of lower meridians; Right-Left Imbalance (R_L), mean of right side meridians minus mean of left side meridians; and Yin-Yang Balance (Y_Y), Yin meridians mean minus Yang meridians mean.

Statistical Analysis: used SPSS 19 statistical software to analyze the data. Paired Sample t-tests were performed for each meridian, and each grouping of meridians.

RESULTS

Numbers attending each Yajña are given in Table 1, while pre and post group means for upper and lower meridians are displayed in Tables 2a, 2b, and 3 – Upper and Lower Meridians, and Group Meridian Averages, respectively.

TABLE 1: NUMBER OF SUBJECTS ATTENDING EACH YAJÑA

Homa Name	Attendees (No's of each)
Ayushyamahamrthunjaya	15
Lakshmi nresimhagayathri	15
Dhanvanthari	17
Nakshatreshti	12
Shradhamedha prajna	6
Sudarshana	2
Navagrahashanthi	2
Shrisuktha	8
Purusha suktha	6
Shanmukhajayathri	4

Table 1 Caption: Table 1 presents the total number of attendees for each yajña including the performer. The first four yajñas were performed more than once. For these the overall total is given. The total number of assessed attendances was 87, for which data was analyzed, as given in Tables 2a, 2b and 3.

TABLE 2a: AVERAGE UPPER MERIDIAN READINGS PRE - POST YAJÑAS

Group	PRE		POST		t	p
	Mean	SD	Mean	SD		
LU_L	54.57	23.49	56.07	23.60	-.645	.521
LU_R	52.57	20.15	55.40	21.93	-1.245	.217
PC_L	57.55	20.12	57.54	20.60	.005	.996
PC_R	56.46	21.18	54.25	18.53	.811	.419
HT_L	57.93	21.46	58.37	21.92	-.173	.863
HT_R	55.86	19.61	55.33	18.18	.226	.822
SI_L	53.68	17.26	56.32	16.46	-1.409	.162
SI_R	53.70	19.62	55.49	19.30	-.686	.495
TE_L	51.56	19.04	52.32	17.80	-.339	.735
TE_R	52.16	19.64	52.53	17.07	-.173	.863
LI_L	57.38	18.94	56.94	20.38	.214	.831
LI_R	58.51	26.58	55.10	19.90	1.413	.161

Table 2a Caption: Table 2a presents average meridian reading data for the six upper meridians on both sides of the body, pre and post the various yajñas performed. Mean ranged from 51.56 to 58.51. None of the pre-post differences reached significance on the individual level.

TABLE 2b: AVERAGE LOWER MERIDIAN READINGS PRE AND POST YAJÑAS

Group	PRE		POST		t	p
	Mean	SD	Mean	SD		
SP_L	50.80	20.75	54.48	24.38	-1.474	.144
SP_R	47.17	19.78	54.69	25.66	-2.862	.005
LR_L	52.39	17.20	60.18	21.94	-3.330	.001
LR_R	49.61	18.56	57.43	24.15	-3.681	.000
KI_L	46.80	23.49	54.39	24.92	-2.931	.004
KI_R	48.78	25.34	55.06	22.35	-2.644	.010
BL_L	51.66	26.92	54.55	23.58	-1.069	.288
BL_R	48.55	27.07	51.79	22.61	-1.313	.193
GB_L	55.94	21.71	63.56	22.85	-3.694	.000
GB_R	54.92	22.29	63.17	23.39	-3.865	.000
ST_L	56.51	19.64	62.39	20.02	-2.531	.013
ST_R	56.00	18.29	62.62	21.37	-3.449	.001

Table 2b Caption: Table 2b presents average meridian reading data for the six lower meridians on both sides of the body, pre and post the various yajñas performed. Means range from 46.80 to 63.56. Nine out of twelve pre-post differences reached significance, while two others show weak trends.

TABLE 3: AVERAGE GROUP MERIDIAN READINGS PRE AND POST YAJÑAS

Group	PRE		POST		t	p
	Mean	SD	Mean	SD		
LOW	39.62	14.136	43.01	14.334	-2.415	.018
MEDIUM	52.33	14.707	55.92	15.791	-2.493	.015
HIGH	66.13	16.311	69.78	16.211	-2.396	.019
YIN	52.36	14.967	56.37	15.267	-2.650	.010
YANG	54.21	15.531	57.54	15.136	-2.351	.021
P.I.E.	65.70	13.274	65.97	13.817	-.143	.886
EL	52.95	14.941	56.25	15.067	-2.301	.024
ES	78.91	12.179	80.11	11.273	-.788	.433
U_L	21.68	13.256	19.83	13.957	1.011	.315
L_R	7.18	6.553	8.00	6.789	-.866	.389
YIN/YANG	7.73	5.958	7.02	5.758	.898	.372

Table 3 Caption: Table 3 presents average group meridian data, giving means and standard deviations pre and post yajñas. The pre-post differences that reached significance individually were energy level, and its various subdivisions, Low, Medium and High, and Yin and Yang.

The failure of the U_L values to report the significant result given from the analysis of upper and lower meridians separately is a reflection of the poor reporting by AcuGraph software.

DISCUSSION

Yajñas are Vedic performances designed not only to fulfill the specific aim (sankalpa) of each yajña, but also to bring life in tune with natural law for both the individual, and the cosmos as a whole. By looking at their effects on acupuncture meridian readings, this study investigates the effect of participation in yajña performance on individuals. The findings of increased conductances in lower meridians, resulting in increased overall E_L ('energy level') values, and increased balance between upper and lower meridians, suggests that the life of the participant is

indeed being brought into tune with natural law. This is because imbalances in the physiology that may lead to pathology may be taken as a sign of being out of tune with natural law.

As regards the upper and lower meridians, all twelve (six left-right pairs) lower meridians increased, which translates into $p < 0.00025$ on a sign test. Nine out of twelve increased significantly as individual meridians, while two more exhibited a mild trend ($0.1 < p < 0.2$). For the upper meridians, only seven out of the twelve (six left-right pairs) increased, and none of them reached significance individually. Performing the analysis on all upper meridians, and all lower meridians taken together as blocks of $12 \times 87 = 1044$ data points, showed that the upper meridians still showed strictly no average change, while pre-values of the lower meridians were significantly less than those of the upper meridians ($t = 3.80$, $p = 0.0001$), while post values were significantly higher ($t = 2.52$, $p = 0.012$). In spite of failure to influence the upper meridians, the E_L, overall Energy Level, also increased significantly, as did all its subdivisions, lower, medium, high etc.

The result for lower meridians is by no means unique. Other observed ways to preferentially improve lower meridian values include the relatively vigorous Yoga exercise program for the obese (Choudhary, 2014), and Acupressure walk (Meenakshy, 2014a), which has been found to decrease upper meridian values. The Systematic Management of Excess Tension (SMET) program (Nagendra, 1986), on the other hand, has been observed to significantly raise conductances in both upper and lower meridians (Meenakshy, 2014b), and to nullify initial significant differences between them.

The elimination of imbalances suggests that, like other Yoga-related programs (Nagilla, 2013; Sharma, 2014c; Meenakshy, 2014c) the influence of yajñas is to improve regulation of the system – imbalances being open to the interpretation of poor regulation.

The strength of study is that there were a large number of readings, a total of 87 before and after the yajñas making the levels of significance for lower meridian increases very high. The weakness of the study was that there was no explicit control group – nor self-as-control readings. Future research in this area needs larger groups for single yajñas to compare effectiveness of different kinds of yajña. Some may produce more intense results than others.

CONCLUSION

This was a useful, first AcuGraph study of effects of participation in yajña performance on subtle energy levels of participants. In particular, yajña participation was found to increase Jing-Well meridian endpoint conductances (subtle energy levels) in the lower meridians, and remove the usual upper-lower imbalances. It can therefore be used to help pathologies like T2DM where conductances are typically smaller for lower meridians. The data contrasted well with other before and after AcuGraph studies of various kinds of procedure and activity. Further studies of yajñas should definitely be pursued.

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