

PART-1

**MUDRA**

*DISSERTATION SUBMITTED BY*

**BIPLOB MONDAL**

*TOWARDS THE PARTIAL FULFILMENT OF*

**MASTER OF YOGA**

*UNDER THE GUIDANCE OF*

**SANJIB PATRA, Ph.D.**

**JUDU ILAVARASU, MSc**



**Swami Vivekananda Yoga Anusandhana Samsthana**

(Declared as Deemed University Under Section 3 of the UGC Act, 1956)

**BANGALORE- 560019,**

**INDIA.**



## **ACKNOWLEDGEMENT**

I would like to express the deepest gratitude to my guides Dr. Sanjib Patra and Judu Ilavarasu for their guidance and encouragement.

I would like to thank all the members of the faculty, staff and students for their help at different stages of this work. Also, I would also be glad to extend my special appreciation for the students who were involved in my study as subjects.

My special gratitude goes to my university Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA) for its support at every stage of my research.

I am indebted to my parents, friends and others who were either directly or indirectly involved for their inspiration, love and support.

It would never be complete unless I thank the unseen Divine, without whose grace, none of this would have been possible.

Date:

**BIPLOB MONDAL**

Place: Bengaluru

Name of the candidate

PART-2

**Immediate Effect of Mudras on Electro photonic Imaging Parameters on Novice Healthy Adults**

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## DECLARATION

I, hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA), Bengaluru, under the guidance of Dr. SanjibPatra, examination controller, SVYASA University, Bengaluru and 'Dr. SudheerDeshpande, registrar, SVYASA University, Bengaluru.

I also declare that the subject matter of my dissertation entitled **Immediate Effect of Mudras on Electro photonic Imaging Parameters on Novice Healthy Adults** has not been previously formed the basis of the award of ant degree, diploma, associate-ship, fellowship or similar titles.

Date:

Place: Bengaluru

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Place: Bengaluru

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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	=	लस
e	=	ए	ḍa	=	ड	va	=	व
ai	=	ऐ	ḍha	=	ढ	śa	=	श
o	=	ओ	ṇa	=	ण	ṣa	=	ष
au	=	औ	ta	=	त	sa	=	स
m̐	=	अं	tha	=	थ	ha	=	ह
ḥ	=	अः	da	=	द	kṣa	=	क्ष
ka	=	क	dha	=	घ	tra	=	त्रस
kha	=	ख	na	=	न	jña	=	ज्ञ

ga = ग gha = घ

## IMMEDIATE EFFECT OF *MUDRAS* ON ELECTROPHOTONIC IMAGING PARAMETERS ON NOVICE HEALTHY ADULTS

### ABSTRACT

**Context:** Mudras and its effects are well known, however scientific studies on effects of mudras are scarce. This paper presents use of Electrophotonic Imaging (EPI) technique using GDV instrument to study the effects of mudras.

**Aims:** 1) To study the effect of five minutes attention on finger tips of both hands on EPI parameters. 2) To study the effect of five minutes practise of *prana mudra* on EPI parameters.

**Settings and Design:** The participants were from a Yoga University and a *Ayurvedic* Medical College, in the southern India. For study 1, single group pre-post design was chosen, and for study 2 two group pre-post design was adopted with control.

**Methods and Material:** In study 1, EPI data were taken using GDV before and after giving five minutes focused attention on finger tips. For study 2, the experimental group practised *prana mudra* for five minutes and control group were comfortable seated for same duration.

**Statistical analysis used:** Paired sample t-test and Independent sample t-test were used for analysis for within group and between group comparison respectively.

**Results:** Within group comparisons showed increase in area, normalised area, average intensity, and entropy, without significant between group differences.

**Conclusions:** This suggests practice of mudras and attention may enhance the EPI activity as measured by GDV, indicating enhanced flow of *prana*. However to study the effects of mudras along methodological refinement is required.

**Key-words:** Mudra, gesture, Electrophotonic Imaging, Gas Discharge Visualization, Prana, Yoga

### GAS DISCHARGE VISUALIZATION (GDV)

GDV is also known as Electrophotonic Imaging (EPI). Working principle of GDV: GDV is based on Kirlian photography principle. It uses a short pulse of 10 KV, 0.1 milli ampere current, with high frequency. This current characteristic does not harm human beings. When such a current is applied to tip of fingers, electrons and photons are stimulated from the finger tips. These extracted photons and electrons is called photo-electron emission. These emitted particles



accelerate in the electromagnetic field created by the high voltage, low current characteristics, and generates an avalanche on the surface of the glass (dielectric) surface. This is called "sliding gas discharge" The discharge causes glow from the excitement of molecules in the surrounding gas, and this glow is what are being actually measured using this device. In GDV technique, electrons and photons from the finger tips are stimulated, and then intensify the resulting glow thousand times, hence makes the measurement process easy.

When voltage pulses lasting more than a few milliseconds are transmitted to the cutaneous covering, tissue polarization takes place and ionic conduction starts. In EEG and electro-acupuncture techniques, this tissue polarization due to overlapping of electrodes is overcome by the use of special gels. In GDV technique however, a very short pulse is applied and hence depolarization does not occur and ionic currents are not initiated.

Source of electrons in the body: This is a two stage process. In the first stage, the electrons from the outer layers of the cutaneous covering and surrounding tissue. The number of electrons is limited. In the second phase, electrons from the deeper tissue are involved. One of the sources of electron is albuminous systems. Free radical exchange inside the cell is another source of these bioelectrons. In a healthy system, inside the mitochondria of the cell, electronic processes are involved in ATP generation. Under normal regulation, this cellular process ensures an optimal level of electron flow. However, when the system is in a state of imbalance, this supply of electrons inside the cells is compromised and this is reflected in the EPI-gram (image captured from GDV) as a lack of glow. Hence this is a marker of physiological abnormality.

Energy measurement in GDV: From the above discussion, it is evident that the energy referred in GDV technique is the mitochondrial activity generating electronic activity inside the cell. Hence in GDV body's potential energy reserve is measured. It has been established that GDV measurements reflect the activity of autonomic nervous system and the balance of sympathetic and parasympathetic systems. Hence all the factors which can influence autonomic system can also influence GDV measurements. Weather, chemical in food, efficiency of oxygen absorption, emotional states, etc. Hence GDV parameters are very sensitive to fine physiological and emotional changes. The process of GDV measurement without filter gives this psycho-emotional levels which are highly sensitive to emotional states (Korotkov, 2011).

## GDV PARAMETERS

Area: The number of pixels in the image having brightness above the threshold.

Normalized area: It is the ratio of EPI-gram area to the area of the inner oval a "fingerprint;" it is reported in relative units. This parameter allows comparing EPI indices of people having fingers of different sizes.

Average Intensity: It is an evaluation of the Intensity spectrum for the particular EPI image.

Entropy: Entropy is the degree of disorder in the system (Korotkov, 2002; Korotkov, 2011).

### GDV MEASUREMENT PROCESS

Assessment using GDV is very simple and quick. For this study, GDV measurements were done using without filter as it measures psycho-emotional levels of a person. The subject has to place his finger on the tip of the glass electrode at an inclined angle of about  $45^{\circ}$ - $50^{\circ}$ , just touching the glass surface not pressing too hard. One by one all the ten fingers are assessed in this manner. While measurement is being taken, surroundings of the hand are covered in order to avoid external light passing in. The whole process takes about five minutes including giving instructions to the subjects.

Mudra is very easy to perform because it requires very minimum effort. The benefits they possess are different from those of asanas and other yogic practices. People may not be able to perform all asanas and pranayama but they find it easier to perform mudras. Mudras effect on our energy levels and at the glandular levels too (Nigamananda, 2001). It also has an immediate effect on our *pranic* sheath and thus forms an integral part of yoga. In spite of its great importance, no active research has been done regarding *mudras*. Hence the need for the study is greater and it is aimed at throwing light into the various aspects of *mudras*, mainly in relation to energy levels as well as its therapeutic application.

### Gas Discharge Visualization (GDV)

Various researches have also been published on Gas Discharge Visualisation (GDV) in which papers quote studies ranging from monitoring water properties (Dynamic Electrophonic Analysis) to the detection of human emotions. This bio-electrographic method of analysis could be potentially implemented successfully in the preventive health care system. GDV images on interventions such as meditation, yoga and stress management techniques showed marked improvements as shown by enhanced images. Its benefits could be based on the facts that it is non-invasive, its accuracy in recording and most importantly, is capable of interpreting functional state of the individual (Cohly et al, 2009). It has to be however to be seen that much of

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## INTRODUCTION

*Mudra* is a Sanskrit word which means gesture or attitude, it is a symbolic gesture used in *Tantric* rituals and *Buddhist* tradition. *Tantra* literature uses *mudras* as a part of Panch'M'kar *sadhana* (Nigamananda, 2001). Yogis believe that the practice of *mudra* can channelize kundalini power. In Buddhist Tantra, *mudra* is one of the terms used for a male practitioner's female consort (White, 2000). The *Kularnava Tantra* traces the word *mudra* to the root *mud*, meaning delight or pleasure, and *dravya*, coming from *dru*, which means to draw forth (Satyananda, 2009). In classical dance of India, *mudras* express different moods like anger and love through different eyes and finger gestures. *Purana* says different *mudra* contains different avatars, like *koorma mudra*, *matsya mudra*. *Hathayoga* text defines *mudras* as specific body position which channelizes energy (Muktibodhananda, 2011). *Mudras* can be described as psychic, emotional, devotional and aesthetic gestures or attitude. Yogis have experienced *mudras* as attitudes of energy flow, intended to link individual pranic force with universal or cosmic force (Satyananda, 2009). Through *mudras* specific qualities of *Shakti* or *Devi* are invoked within the practitioner (Muktibodhananda, 2011). Therefore, in order to awaken the goddess, who is asleep in the mouth of the *Brahmarandhra* (the innermost hollow of Sushumna), the *mudras* should be practised with greatest care (Vasu, 2008). According to *Gherandha Samhita* drawing in prana by *kaki mudra* and join it with *apana vayu* helps awakening of the *Shakti*. Traditionally *mudras* are well known but scientific studies on *mudras* are rare. Therefore, in this study we have attempted to make a scientific study of *mudras* and its effects.

## 1.1 ORIGIN OF MUDRA

According to tantra lord Siva was the first exponent of *mudra* (Nigamananda, 2001). These texts describe over a hundred forms of *mudras*. Of those, yoga has utilized approximately twenty five major *mudras*, which are also referred to in the *hathayoga* text, such as *Gherand Samhita* (Digambarji & Gharote, 1978) and *Hatha Yoga Pradipika* (Muktibodhananda, 2011). It has been found that *mudras* are practiced by peoples of various cultures. In the East, these can be observed in the rituals and rites of the rich cultural traditions of Hinduism and Buddhism in India, Tibet, China, Japan, Indonesia, etc. The paintings in the caves of Ajanta and sculptures in the Ellora caves, dating back to 2<sup>nd</sup> and 1<sup>st</sup> century AD.

## 1.2 MUDRAS IN DANCES

The Indian classic dance used *mudras* for nonverbal expression. There *mudras* are used like symbol like anger and love through different eyes and finger gestures. Its benefits can be reaped while executing a dance reunion (Gopinath, 1996). Therefore dance also is beneficial for our physical, mental and spiritual health. Various dancing *mudras* are: *Patakam*, *Musrkhyam*, *Katakam*, *Mushti*, *Karimukham*, *Sukathundram*, *Kapitham*, *Hamsapaksham*, *Sikharam*, and *Hamsasyam*. Every gesture has its own *bhava*. One explanation of the term is that it is a joining of *mud* (bliss) and *dra* (dissolving). *Mudra* is that which dissolves duality (i.e. between worshipper and deity) and thus joins the relationship. *Mudras* bring the chosen deity closer to the

practitioner, and vice versa. Mudra has also been described as 'finger play' - echoing, on the human level, the divine play or *lila* of Shiva-*Shakti* (Hine, 2012).

The *Pali* word for mudra, *muddika*, derives from *mudda*, meaning authority. There is thus a developing interrelationship in these meanings of a gesture enhancing and authenticating the spoken word with mystical and magical values. The gesture is a sign, a ritual seal; seal implies authenticity. In ancient Indian culture these mudras play a big role even in everyday life, from religious to social practices. Images of Hindu gods often stand with some type of posture, and their hands mention some gesture that is all various types of mudra. Lord Siva's *pralaya nritta* (dance of divine demanifestation) and *Kali's* postures mention different mudras. For worshipping god, chanting, and *homa* Indians have mudras. In this culture various expressions like *namaskara*, and *ashirvaada mudras* are used. Dance and sculptor are full of mudras.

### 1.3 SCIENCE BEHIND MUDRAS

Mudras create a link between an attitude, posture or movement adopted by the external, physical body. They connect *annamaya* and *pranamaya kosha* together, and this later influences *manomaya kosha* (Nigamananda, 2001). According to the yogis text our body is supported by sixteen *adharas* or bases those are physical, pranic and mental. There is a constant influx and out flux of prana in our body. Our body is always in a state of exchanging energy, In Sanskrit our body call *dahya* (*dahata* + *ait* = *dahya*) it means which is always burning and exchanging prana. In yogic terms that is called pranic energy, and in modern science it is known as bio-plasmic energy (bio-photon). These pranic circulations are essential for regulating our body functions but a large amount of energy is spent in this way. If we channelize this same force internally it will give more energy to our body and it will cool down our mind. Mudra can be effectively used to channelize our energy inwards. The mudras are specifically designed to create a movement, a posture and attitude in the major extremities of the body (Nigamananda, 2001).

#### MUDRA AND PRANIC ENERGY:

The attitudes and postures adopted during mudra practices establish a direct link between *annamaya kosha*, the physical body, *manomaya kosha*, the mental body and *pranamaya kosha*, the energy body. Initially, this enables the practitioner to develop awareness of the flow of prana in the body. Ultimately, it establishes pranic balance within the *koshas* and enables the redirection of subtle energy to the upper chakras, inducing higher states of consciousness.

Mudras manipulate prana in a very fine way. The *nadis* and chakras constantly radiate prana which normally escapes from the body. Through the practice of mudra, the energy is redirected within. For example, by prana being radiated through the eyes is redirected back. In the same

way, the sexual energy emitted through *vajra nadi* is redirected to the brain through the practice of *vajrole* mudra (Satyananda, 2009). *Tantric* literature states that once the dissipation of prana is introverted, it induces a state of *pratyahara*, sense withdrawal, which is important for awakening *kundalini*. For this reason they are incorporated extensively in *kriya* and *kundalini yoga* practices (Satyananda, 2009).

It requires a lot of awareness of the psycho-physiological interaction, to understand the effects of mudras. When prana falls from *manipura* to *mooladhara*, we fall back into instinctual living. The aim of mudras is to create fixed, repetitive postures, gestures and attitudes, which can break these old, instinctive habit patterns and bring us back into a more refined state of consciousness. For example, when we hold the hands in the position of chin mudra for a period of time, then a signal goes to the brain. After some time we became used to it and the signal becomes less. Even though the signal is still going to the brain, we no longer feel it. *Mudras* allows us to develop control over the generalized system of the brain (Nigamananda, 2001). Mudras provide a means to assess and influence the unconscious reflexes and primal, instinctive habit patterns that originate in the primitive areas of the brain around the brain stem (Satyananda, 2009). Each mudra sets up a different link and has a correspondingly different effect on the body, mind and prana. Therefore *mudra* helps to develop inner consciousness.

#### 1.4 TYPES OF MUDRA

The yoga mudras can be categorized into approximately five groups, which are:-

- 1) *Hasta mudra*,
- 2) *Mana mudra*,
- 3) *Kaya mudra*,
- 4) *Bandha mudra*, and
- 5) *Adhara mudra*.

##### 1) HASTA MUDRA (HAND MUDRA)

The hand *mudras* redirect the prana emitted from the hands back into the hands back into the body. *Mudras* which join the thumb and index finger engage the motor cortex at a very subtle level. They generate loop of energy which moves from the brain down to the hand and then the energy which moves from the brain down to the hand and then back again. Conscious awareness of this process rapidly leads to internalization. *Mudras* included in this category are: *Jnana mudra*, *Chin mudra*, *Yoni mudra*, *Bhaitava mudra*, *Hridaya mudra*, and *Prana mudra*.

##### 2) MANA MUDRA (HEAD MUDRAS)

Many of these mudras are used in kundalini yoga practices and are majorly accompanied by meditation techniques. They utilize the eyes, ears, nose, tongue, etc. Mudras included in this category are: *Sambhavi mudra*, *Nasikagra mudra*, *Khechhari mudra*, *Kaki mudra*, *Bhujangini mudra*, *Akashi mudra*, *Shanmukhi mudra*, and *Unmani mudra*.

### 3) KAYA MUDRA (POSTURAL MUDRAS)

This practice utilizes physical postures combined with berating and concentration. Mudras included in this category are: *Vipareeta karani mudra*, *Pashinee mudra*, *Yoga mudra*, *Mundaki mudra*, and *Tadagi mudra*.

### 4) BANDHA MUDRA (LOCK MUDRAS)

These practices combine mudras and *bandhas* (locks). They charge the system with *prana* and prepare it for kundalini awaking. Mudras included in this category are: *Maha mudra*, *Maha bheda mudra*, and *Maha vedha mudra*.

### 5) ADHARA MUDRA (PERINEAL MUDRAS)

These techniques redirect prana from the lower centre to the brain. Mudras concerned with sublimating sexual energy are in this group. Mudras included in this category are: *Ashwini mudra*, *Vajroli mudra*, and *Sahajoli mudra*.

## 1.5 YOGA AND MUDRA

Mudras also form an intimate aspect of yoga practices, though they basically came from tantra traditions. However, tantra is also considered as a kind of yoga. We can say it is an independent part of yoga. Yogis used mudra for channelizing the energy from *mooladhara to sahasrara*. There are various types of yoga, and all of which may form part of a *tantric* system. The physical based sadhana, called *hatha* yoga is the most widely known type of yoga. Kriya yoga uses visualization, gesture and ritual worship. *Laya* yoga explains how the concentrated mind can lead to forgetting the materialistic world and enjoy the Samadhi state. Mantra yoga is also a part of tantra in which they use mantra *japa* for *sadhana*, the concept mudra is the physical gesture of mantra. In *hatha yoga mudra* is used for connecting two points of energy in our body.

Mudra is also a part of laya yoga. According to *Gheranda samhita*, yogis practice *Sambhavi mudra* for *dayana*, *khechhari mudra* for enjoying varieties of tastes and *yoni mudra* for enjoying physical pleasure. The phenomenon of *kundalini* is the basis of *yoga* and therefore many of the *tantric* practices like *mudras* also came to *yoga*.

## 1.6 APPLICATION OF MUDRA

Any living body is made of five distinct elements: fire, wind, ether, earth, and water. These are the five building blocks that go into the formation of any living body. Several ancient health systems are based on the concept of the balance of the five elements. According to Ayurveda, an



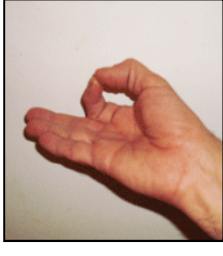









Indian medical science, distortion or impairment of the 5 elements creates outer disturbance and inner sickness in the body. The 5 fingers of the hands represent these 5 elements : the thumb symbolises the fire, the forefinger symbolises the Wind, the middle finger for ether, the ring finger for the Earth, and the little or small finger symbolises the water (figure 1).



Figure 1: five great ailment in our finger

The various mudras are depicted in the following figure. They are the major mudras commonly

sused. Figure 2: List of common mudras

				
Figure-2 <i>Chin Mudrā</i>	Figure-3 <i>Adi Mudra</i>	Figure-4 <i>Brahma Mudra</i>	Figure-5 <i>Gyan Mudra</i>	Figure-6 <i>Pran Mudra</i>
				
Figure-7 <i>Ling Mudra</i>	Figure-8 <i>Vayu Mudra</i>	Figure-9 <i>Prithvi Mudra</i>	Figure-10 <i>Surya Mudra</i>	Figure-11 <i>Apan Mudra</i>

### *Chin Mudra*

Thumb and forefinger on each of both hands join as a zero. The rest of the fingers are extended, with the middle finger touching the non-folded part of the forefinger. The hands are placed palms-down on the thighs while sitting in *Vajrasana*. This *mudrā* activates the diaphragm, making for deep "stomach-breathing", as the diaphragm pushes out the internal organs when it descends towards the pelvis on inhalation. Slow rhythmic breathing in a 5-2-4-2 rhythm (5 being the exhalation and 4 is the inhalation) makes prana flow in the pelvis and in the legs.

### *Adi Mudra*

The thumb is folded into the palm, touching the base of the small finger. The rest of the fingers are folded over the thumb, to create a fist. Like in *Chin Mudrā*, the hands are placed palms-down on the thighs while sitting in *Vajrasana*. This *mudra* activates the pectoral muscles, making the chest expand forward on inhalation. Slow rhythmic breathing in a 5-2-4-2 rhythm (5 being the exhalation and 4 is the inhalation) makes prana flow in the throat and in the head.

### *Brahma Mudra*

Palms are in *Adi Mudrā*, but the inside of the palms face upwards and are located at the level of the navel, with the left and right knuckles and first finger joints touching. This is done while sitting in *Vajrasana*. Breathing becomes full: in inhalation, the diaphragm descends, the ribs then expand, and then the pectoral muscles move forward. Exhalation works

### *Gyan Mudra*

In this position the fingers are held with the tip of the index finger touching the tip of the thumb and the remaining three fingers nearly straight--kind of like an "OK" sign, except the palms of each hand are pointed up or front. This mudra is good for: stresses and strains, insomnia, emotional instability, indecisiveness, excessive anger, idleness, laziness, indolence, and is a great help in increasing memory and I.Q. It can help cure sleeplessness and get one off sleeping pills where these are being taken.

### *Prana Mudra*

This finger position is an all time useful Mudra and can be done for any length of time, any time, any place and will only help in adding to the benefits. This is the mudra which, along with the Apan Mudra, precedes any efforts at higher meditation by the Yogis and saints. The mudra helps to increase the Pran Shakti or the "Life force". It increases one's self confidence. It helps the body in increasing its vitality and sustenance when deprived of food and water. It helps in improving weak eyesight and quiescence (motionlessness) of the eyes. It supports any other treatment where the patient is short on confidence.

### *Ling Mudra*

Generate heat in the body. It destroys phlegm and helps in problems of colds, catarrh and coughs. It is excellent when the body is cold due to shortage of cover in inimical weather. This mudra must be performed under supervision or with full knowledge

### *Vayu Mudra*

This finger position is unbeatable in quickly and effectively removing the accumulated wind in the stomach. Depending on one's physiology, it may take anywhere from 1 minute to 15 minutes or so to effectively expel all accumulated wind in the stomach without the use of anti-flatulants. *Mudra* should be stopped when the trouble abates.

### *Prithvi Mudra*

Increase solidity in the body. Remove weakness, lack of body solidity. Helps gain for underweight, chronic fatigue and weakness.

### *Surya Mudra*

It helps to reduce the accumulated fat in the body and unwanted cholesterol. It helps in removal of accumulated fat in body, reduces cholesterol.

### *Apana Mudra*

Helps in purification of the body, urinary problems, easy secretion of excreta, regulating menstruation and painless discharge, easy child delivery, Piles, Diabetes and kidney disorders.

## REVIEW OF LITERATURE

### 2.0 LITERARY RESEARCH ON MUDRAS

It is said that thirty-two Gayatri mudras, a set of Vedic hand gestures corresponding to the practice of *Gayatri japa* that is done thrice a day. Slow rhythmic execution of *mudras* along with chanting mantra completely balance body and mind. The *Gayatri mantra* has twenty four syllables and there are twenty four Gayatri mudras that correspond to the mantra like *sumukha*, *samputa*, *vitita*, *vistra*, etc.. There is also a mention of eight *mediation mudras* after *Gayatri japa*. Various texts describe about mudras. They are briefly presented here.

#### 2.1 Mudras according to *Hatayoga Pradipika*

त मा सव य ँन बोधयितुमी र म

रमुखे सु िं मु ि यासं स॥चरेत

*tasmātsarvaprayatnena prabodhayitumīśvarīm|*

*brhmadvāramukhe suptāṁ mudrābhyāsaṁ samācaret||5||*

Therefore, the goddess sleeping at the entrance of *Brahma*'s door should be constantly aroused with all effort by performing mudra thoroughly ( *Hatha yoga pradipika*).

महामु ि महाबंधो महवेध खेचर ।

उ ड यानं मुलबंध बंधो जालंधराभिधः॥६॥

*mahāmudrā mahābandho mahavedhaśca khecarī|*

*uḍḍiānaṁ mulabandhaśca bandho jālaṁdharābhidhaḥ||6||*

करणी वपर ता या व ोली श ्चालनम

इदं ह मु दशकं जरामरणनाशनाम् ॥

*karāṇī viparītākhyā vajrolī śakticālanam*

|*idaṁ hi mudrādaśakaṁ jarāmaraṇanāśanam*||7||

“*Maha mudra, maha bandha, maha vedha, khechari, uddiyana, moola bandha and jalandhara bandha. Vipareeta karani mudra, vajroli and shakti chalana, verily, these are the ten mudras which distort old age and death. ( Hatha yoga pradipika -3:6-7 ).*”

In this *sloka*, the most important mudras and *bandhas* have been listed : *Maha mudra*, the great attitude, *Maha Bandha*, the great lock , *Maha vedhamudra*, the great piercing attitude, *khechari mudra*, the attitude of dwelling in supreme consciousness, *uddiyana Bandha*, the abdominal retraction lock, *Moola Bandha*, perineum/cervix retraction lock, *jalandhara Bandha*, throat lock, *vipareeta karani mudra*, the attitude of reversing, *Sakti chalana mudra*, the attitude of moving or circulating the energy (Muktibodhananda, 2011).

2.2 Mudras according to *Gheranda Samhita*

महामु ा नभोमु ा उ ड यानं जल धरम

मुलब धो महाब धो महवे खेचर ॥१॥

*mahāmudrā nabhomudrā uḍḍiyānaṁ jalandharam*|

*mulabandho mahābandho mahavedhśca khecarī* ||1||

बपर तकर योनिव ोली श च नी

ताडागी म डुक मु ा शांभवी प चधारणा ॥२॥

*biparītakarī yonirvajrolī śakti calnī*

*tāḍāgī maṅḍukī mudrā śāmbhavī pañcadhāraṇā* ||2||

अ नी पाशिनी काक मातङ्गी च भुज डगनी।

प च वंशतिमु । स दा इह योगिनाम

*aśvinī pāśinī kākī mātāṅgī ca bhujāṅganī|*

*pañcaviṁśatimudrāśca saddhidā iha yoginām||3||*

*Mahamudra, Nabhomudra, Uddiyanamudra, Jalandharamudra, Muhlabandhamudra, Mahabandhamudra, Mahavedhamudra, and Khecharimudra. Viparitakaranimudra, Yonimudra, Vajrolimudra, Shaktichalani, Tadagimudra, Mandukimudra, Shambhavamudra, the five Dharana, Ashvinimudra, Pashinimudra, Kakimudra, Matangimudra and Bhujanginimudra.*

The *Gheranda samhita* discusses about 25 types of mudra. It appears to be an all inclusive group, since the list contains what are called *Bandhas* as well as the five kinds of *Dharanas*. The nature of the set is more physical or physiological at one end and more psychological at the other.

वलितं पलितं चैव जरा मृ युं निवरयेत्

यकासं उदावत लीहाजीण वरं तथा।

नाशये सव रोगां महामु । साधनात्

*valitaṁ palitaṁ caiva jarā mṛtyuṁ nivarayet|*

*kṣayakāsaṁ udāvartapliḥājīṇajvaraṁ tathā|*

*nāśayetsarvarogāṁśca mahāmudrāprasādhanāt||6||*

By practising *Mahamudra*, one can destroy consumption, cough, and obstruction of the bowels, enlargement and fever.

योनिमु । परा गो या देवानाम दुर्लभा।

सुकृ तु धसंसि : समाधिः स एव ह॥३८॥

*yonimudrā parā gopyā devānāmapi durlabhā|*

*sukṛntu lbdhasarṁsiddhiḥ samādhiśaḥ sa eva hi||38||*

This yoni mudra should be carefully guarded. It is not easily attainable even by the gods. Once it accomplished, the Yogi has verily entered Samadhi.

याव त्दरे रोगा अजीणा धा वशेषतः।

त सवा नाशयेदाशु य मु ा भुजङ्गिनी॥७०॥

*yāvantscodare rogā ajīrṅādhā viśeṣataḥ|*

*tansarvānnāśayedāśu yatra mudrā bhujāṅginī||70||*

Whoever practices *Bhujangini Mudra*, quickly destroys all his diseases of stomach, Particularly indigestion (Digambarji & Gharote, 1978).

2.3 Mudras according to *Hatharatnaavali*

महामु ा महाब धो महाबेध तृतीयकः॥

उ डडयानां मुलब धो ब धो जाल धराभिधः॥३२॥

*mahāmudrā mahābandho mahābedhastṛtīyakaḥ||*

*uḍḍayānāṁ mulabandho bandho jālandharābhidhaḥ||32||*

करणी वपर ता याव ळी श ञ्चालनम

स दाया खेचर सा दश मु ाः क ति ताः॥३३॥

*karaṇī viparītākhyā vajrolī śakticālanam||*

*sampradāyā khecarī sā daśa mudrāḥ prakīrtitāḥ||33||*



*Hatharatnavali* mention about 10 kinds of *mudras* those are basically for higher *sadhana*. Here *hastha mudra* is not mentioned.

आ दनाथो दत्ता मु ा अ य दायकाः

व लभाः सव सि ण्मं द्भा महताम प॥३४॥

*ādināthoditā mudrā aṣṭaiśvāryapradāyakāḥ*

*vallabhāḥ sarvasiddhānāṁ durlabhā mahatāmapī*||34||

This is the set of the mudras told by *Adinatha Sambhu*, bestow upon one the eight supernatural powers and are highly respected by all the *siddhas*, but are difficult to be achieved even by the great.

इति मु ा दश ो ा आ दनथेन श भुना॥

एकैका तासु मु या य महासि दायिनी॥३५॥

*īti mudrā daśa proktā ādinatheana śambhunā / /*

*ekaikā tāsū mukhyā syānmahāsiddhiapradāyinī / /35 / /*

This is the set of mudras told by *Adinatha Sambhu* each one of them is of great significance, which brings about great *siddhis*.

यकु गुदावत गु माजीण पुरोगमाः॥

दोषाः सव यं या त महामु ि तु योस्॥४१॥

*kṣayakuṣṭhagudāvartagulmājirṇapurogamāḥ*||

*doṣāḥ sarve kṣayāṁ yānti mahāmudrāṁ tu yo'bhyaset*||41||

All the ailments like consumption, skin disease, constipation, glandular enlargement, indigestion and many other diseases, are cured by the practice of *Mahamudra*. It also removes old age and fear from death. Therefore, it should be care full guarded and should not be imparted to all and sundry (Gharote, Devnath, & Jha, 2009).

#### 2.4 Mudras according to *Goraksasatakam*

महामु ँ नभोमु मु डडयानं जल धरम

मुलब धं चयो वे त स योगी सि भा ज्ञान्मा

*mahāmudrām nabhomudramuḍḍayānaṁ jalandharam*

*mulabandham c yo venti sa yogī siddhibhā janam*||32||

This *sloka* says that the yogi who knows *Mahamudra*, *Nabhomudra*, *Uddiyana*, *jalandhara* and *Mulabandha* he becomes a receptacle of miraculous powers.

व ो य तहनुनि पी य सुचिरं योनिं च वमा ड ा

ह ता यामवधा रतं स र रतं पादं तथा द्ध म

आपूय ननेन कु युगलं ब s वा शनैः र यते

देशा पातकनाशिनी सुमहती मु ा नृणां ो यते॥३३॥

*vakṣonyastahanurnipīḍya suciraṁ yoniṁ ca vamāṅghrāa*

*hastābhyāmavadhāritaṁ prasariritaṁ pādaṁ tathā dakṣiṇm*

*āpūrya śvasnanena kukṣiyugalaṁ bad 'dhvā śanaiḥ racyate-*

*deśā pātakanāśinī sumahatī mudrāa nṛṇāṁ procyate*||33||

With the chin placed on the breast and pressing hard continuously the yoni (the space between the anus and the testes) with the left heel; with the out –stretched right lag held with both hands,

one should fill both the sides with breath, retain it (for a specific) time and expire slowly. This called the *Mahamudra* which destroys all sins of men (Kupalayananda & Shukla, 2006).

## 2.5 Mudras according to *Siva Samhita*

त मा सव य न बोधयितुमी म

हार मुखे सु ि मु ा यासं सम्प्रत्येत

*tassmātsarvaprayatnena prabodhayitumīśvrīm|*

*brahārandhramukhe suptāṛṇ mudrābhyāsaṛṇ samācaret||14||*

Therefore, in order that the goddess, who is asleep in the mouth of the *Brahmarandhra* (the innermost hollow of *Sushumna*) be awakened, the mudras should be practised with the greatest care. (Chandra, 2008).

महामु ा महाब धो महावेध खेचर ।

जालंधरो मुलबंधो बपर तकृति तथा॥

उ डानं चैव व ोली दशमे चालनम

इदं ह मु ादशकं मु ालामु तमो ऽसम्प्रत्येत

*mahāmudrā mahābandho mahāvedhaśca khecarī|*

*jālaṛṇdharo mulabaṛṇdho biparītakṛtistathā||*

*uḍḍānaṛṇ caiva vajrolī daśame śkticālanam|*

*idaṛṇ hi mudrādaśakaṛṇ mudrālāmuntamontamam||15||*

Siva saṛṇhitā explain about ten mudras those are mahamudra, mahabandha, mahavedha, khechari, Jalandhar, mulabandha, viparitkarana, uddana, vajrondi and *shaktichalana*.

एत ामु ादशकं न भूतं न भ व यति।

एकैका या ने सि ः सि ो भ त ना था॥५८॥

*etattumudrādaśakaṁ na bhūtaṁ na bhaviṣyati|*  
*ekaikābhyāsne siddhiḥ siddho bhavti nānythā||58||*

According to *Siva saṁhitā* there are ten mudras whose equal there never was nor ever shall be: throughout the practice of any one of them, the person becomes a *siddha* and obtains success.

मुदं करोति देवानं । य यसुरां तथा।

मोदाना दावाणा यैव मुदेति प र कति ता॥

*mudaṁ karoti devānaṁ drāvyaṅyasurāṁstathā|*  
*modānātdāvāṅācyaiiva mudeti parikirtitā||*

It pleases the *Devas* and liquidates the *Asuras*. That which pleases is known as mudra.

Every being in the universe is surrounded by an aura unique to itself (Vasu, 2008). The aura changes with the condition and the varying temperament. From this aura spread energy waves that influence the originator as well as others in the universe it shares. The aura though invisible to many an eye continues to be. The energy waves flow regardless of perception. In the human body centre anatomical areas exude greater energy waves. One such area is the hands (Gopinath, 1996).

### 3.0 REVIEW OF THE SCIENTIFIC LITERATURE

A study was published concerning the mechanisms responsible for the efficacy of yoga medicine traditionally attributed to the prana. Qi is sometimes considered equivalent to prana. In a study comparing students of yoga versus students from non-yoga background, significant differences were noted in the body, mind and spirit measurement. The Indian and Chinese systems seem to be in correspondence; energies in acupuncture meridians correspond to predicted changes in prana levels in Indian systems of medicine. Studies relating to attention and yoga have been published in the recent years in light of increased research in yoga (Turner & Monk-Turner, 2010). Assessments were made using the AcuGraph, Digital Meridian Imaging System, a computerized tool used to measure and analyse energy levels of acupuncture meridians. However, the world of science is yet to appreciate fully that Yoga is basically a science of the mind (Bhusan, 2013). Another paper discusses the postulates of *Yoga* as a science of mind. The *yogic* practices not only serve as prevention and cure of mental disorders but also result in mental peace and higher psychic and spiritual attainments. In the *yogic* psycho-physiology of the pranic system, the body, mind and spirit work in an integrated manner. Expansion of consciousness takes place through the awakening of the chakras (Bhusan, 2013).

Studies relating to attention and *yoga* have been published in the recent years in light of increased research on yoga. In a study done comparing modern education system versus the *Gurukula* education system, sustained attention was found to be more improved in the latter in a study done in school boys using Six Letter Cancellation Test (Rangan, Nagendra, & Bhatt, 2009). Alternate nostril yoga breathing was shown to influence the ability to pay attention to a given stimulus as shown in a study done at *Patanjali* Research Foundation which was assessed by performance of P300 task (Telles, Joshi, & Somvanshi, 2012). In another study done in SVYASA, a yoga programme comprising of postures, breathing exercises, relaxation techniques, meditation, chanting and lectures on yoga therapy was found to positively and significantly affect variables like sustained attention, emotional intelligence, General health and guna personality. It was found out that the practice of Cyclic Meditation and Supine Rest was shown to improve the performance on the Digit-Letter Substitution Task (DLST) which was used as a psychological test for assessing sustained attention and memory which are important skills for academic and professional performance (Pradhan & Nagendra, 2010).

Pranayama, yoga breathing and stretching postures had an effect on the pulmonary function and diffusion capacity in patients of bronchial asthma and were helpful in raising the energy levels along with calming down in the body by the end of two (Singh et al., 2012). Qi, which is considered equivalent to the prana concept, was shown to be significantly improved in terms energy levels and energy balance with the help of a yoga lifestyle program done in SVYASA (Nagilla, Hankey, & Nagendra, 2013).

the research limitations include small study samples and variety of intervention length and content. Long-term efficacy studies are needed to fully translate the promise of yoga for enhancing mental health.

#### 4.0 PILOT STUDY

A pilot study was conducted in order to find the effect of Mudras on GDV parameters. The results are summarized in table 1.

Table 1: Results of pilot study with eight subjects

Subject	Pre					Post				
	Area	Area normalized	Average intensity	Form coefficient	Entropy	Area	Area normalized	Average intensity	Form coefficient	Entropy
S1	11050	1.68	79.04	13.57	3.18	10991	1.56	78.65	13.79	3.16
S2	5895	0.74	69.35	23.29	2.43	5804	0.73	72.30	20.96	2.45
S3	3515	0.46	64.51	20.15	1.85	4542	0.57	63.99	25.04	2.18
S4	8303	1.45	70.69	18.00	3.18	7796	1.33	68.57	19.09	3.11
S5	11826	3.25	93.63	5.82	1.90	12135	3.22	88.39	6.43	1.90
S6	9976	2.41	76.89	11.76	1.90	9995	2.88	78.69	9.34	2.08
S7	10877	5.69	88.59	6.74	1.95	10631	4.52	86.98	6.625	1.91
S8	11390	3.03	87.85	8.23	1.99	10907	2.91	90.91	7.44	1.99
Mean	9104	2	79	13	2	9100	2	79	14	2
SD	2988	1.69	10.42	6.50	0.574	2739.5	1.38	9.80	7.29	0.52

This pilot study was done only on eight subjects. Moreover, as different mudras were given to each subject and only for three minutes, we could not use this data for sample size calculation. This study served only the purpose of optimizing the data collection process with special emphasize on design of experiment.

## **5.0 AIM AND OBJECTIVES**

### **5.1 AIM OF THE STUDY**

To study how attention to a particular region of the body (finger tips) can change measurement parameters of GDV.

To study the effect of Prana-mudra in our body's energy level using GDV measurements.

### **5.2 OBJECTIVES OF THE STUDY**

To explore the effect of mudras on GDV parameters.

To assess whether GDV could be used to find fine changes which might happen during the practice of mudras.

## **6.0 RATIONALE OF THE STUDY**

### **6.1 RATIONALE**

We intend to study the effects of mudras. Mudra is defined as a psychophysiological posture, gesture or attitude that are intended to link individual pranic force with the universal/cosmic force.

For our study, we operationally define some of the terms in order to give an empirical orientation to the study:

**Pranic energy:** We operationally define pranic energy as the activity as seen in GDV parameters like Area, Integral Area, and Intensity. We also would use an energy level to denote this construct Pranic energy as operationally defined by GDV parameters.

We do not attempt to operationally define universal/cosmic force, as it is more of a theoretical construct, and this will not affect our experimental studies.

### **6.2 HYPOTHESIS**

1) Attention to a particular region of the body (finger tips) can result in a change in the energy level (as measured by GDV) of that part of the body. The rationale for this hypothesis is that prana flows where mind flows. The mind can be channelized using attention. Hence by focusing



attention, it should be possible to change the amount of prana flowing in that region. Hence we expect a change of GDV activity at finger tips after practice of five minutes of attention on finger tips.

2) Similarly, the practice of prana mudra can result in a change in the energy level (as measured by GDV) with time.

### 6.3 NUL HYPOTHESIS

1) Attention to a particular region of the body (finger tips) does not result in a change in the energy level (as measured by GDV) of that part of the body.

2) The practice of prana mudra does not result in a change in the energy level (as measured by GDV), after five minutes of practice of prana mudra, on healthy adults.

## 7.0 MATERIAL AND METHODS

### 7.1 PARTICIPANTS

The students of Sushrutha Ayurveda College and BSc students studying in SVYASA Yoga University, Bangalore, were taken for the study.

#### 7.1.1 SAMPLE SIZE

For first study we took 17 students and for second study we took 61 students, 29 in the experimental group and 32 in the control group. As no study was done on mudras and its effects, and since we could not use the pilot study data for sample size calculation, we took the number around 30 for each group.

#### 7.1.2 SELECTION AND SOURCE OF SUBJECTS

The BSc. students studying in Swami Vivekananda Yoga Anusandhana Samsthana (SVYASA), and Ayurveda students from Sushrutha Ayurveda College formed the source of subjects. Both the institutions are on the same campus. Details of the study were told to the students in a briefing session, and all interested volunteers were invited to the study. Once they came to the lab, they were randomly allotted to either mudra group or the control group.

#### 7.1.3 INCLUSION CRITERIA

1) Both male and female subjects were selected for the study.

2) Age group between 17-35 years.

#### 7.1.4 EXCLUSION CRITERIA

1) Subjects suffering from any major illness.

2) Female participants during menstruation.

### 7.1.5 ETHICAL CONSIDERATIONS

The coordinators of the courses were informed and the project was discussed with them. Upon their approval, consent from the subjects were taken after explaining the whole procedure to them.

### 7.2 DESIGN OF THE STUDY

There are two studies, for the first one, single group pre-post design was chosen to study the effect of attention on EPI parameters. In the first study participant's EPI measurement using GDV at the finger tips were initially assessed (pre data). The participants were allowed to rest and relax for a couple of minutes before the start of the intervention. The subjects were explained about the nature of the study and were given basic information about the GDV instrument as well as the procedure they would have to follow while their readings were taken. They had to keep all the ten fingers one by one on the glass surface of the GDV equipment and data were recorded. Instructions were then given to sit in *sukhasana* (one of the sitting postures), resting both the hands on the knees, palms facing up, and concentrate on the finger tips of both their hands for five minutes, with closed eyes. The post data were then taken. In the second part to study, the effect of prana-mudra in our energy level is looked upon. The design was two group pre-post, with the control group. After coming to the lab, the subjects were randomly assigned to either experimental group or a control group. Experimental group practiced prana mudra in the same sitting posture and for the same duration as in study 1. Prana mudra is adopted by joining the thumb with the ring and little finger, keeping the index and middle finger straight. The control group also followed the same procedure except for adopting Prana mudra, they sat quietly closing their eyes for five minutes, in a similar sitting posture as described earlier. Pre and post assessments were made on both the groups.

### 7.3 DATA EXTRACTION AND ANALYSIS

The data were extracted and four variables related to the activity of pranic (as operationally defined) energy were, area, integral area, average intensity, and entropy. R statistical package was used for analysis. Normality test was performed to decide whether parametric test or non-parametric test should be used. Levene's test was used for checking equality of variance. Paired sample t-tests were used for within-group analysis, and independent sample t-tests were used for between-group analysis.

### 8.0 RESULTS

Between group and within group analyses were done. The significance level was kept at 0.05. For group analysis, baseline was corrected, by finding the difference of pre and post scores. The

results are tabulated in the tables below. Table 2, 3, 4, and 5. Table 2 gives the results of study 1 in which effects of mudras were evaluated.

Table 1: Table showing the mean and standard score of Normalized Area, Area, Average Intensity and Entropy in Attention group

Variable	Pre		Post		t-value	df	p-value
	Mean	SD	Mean	SD			
Normalised Area	1.75	0.59	1.89	0.63	1.53	16	0.147
Area	10005.58	1666.91	10177.70	1820.31	0.38	16	0.715
Average Intensity	73.12	3.73	73.52	4.30	0.32	16	0.712
Entropy	2.00	0.10	2.00	0.05	0.01	16	0.989

\* Table no. 1  $p < 0.05$  comparing the pre and post scores using the Paired t Test.

Table 2: showing the mean and standard score of Normalized Area, Area, Average Intensity and Entropy in *mudra* group

Variable	Pre		Post		t-value	df	p-value
	Mean	SD	mean	SD			
Normalised Area	1.87	0.71	1.98	0.70	1.55	28	0.131
Area	9847.93	1870.35	10621.66	1663.51	3.10	28	0.004*
Average Intensity	73.49	4.93	75.07	5.32	2.51	28	0.018*
Entropy	1.95	0.11	1.96	0.12	0.32	28	0.749

\* Table no. 2  $p < 0.05$  comparing the pre and post scores using the Paired t Test.

Table 3: showing the mean and standard score of Normalized Area, Area, Average Intensity and Entropy in Control group

Variable	Pre		Post		t-value	df	p-value
	Mean	SD	Mean	SD			
Normalised Area	2.64	1.17	2.79	1.11	1.44	31	0.161
Area	10194.32	1341.05	10518.33	876.38	2.11	31	0.043*
Average Intensity	78.62	5.58	80.52	5.70	3.25	31	0.003*
Entropy	1.98	0.07	1.99	0.05	0.55	31	0.586

\* Table no. 3  $p < 0.05$  comparing the pre and post scores using the Paired t Test.

Table 4: showing the mean and standard score of Normalized Area-diff, Area-diff Average Intensity-diff and Entropy-diff in Mudra and Control both group

Variable	t	df	p-value
Normalised Area_diff	0.32	59	0.751
Area_diff	-1.57	59	0.123
Average Intensity_diff	0.39	59	0.698
Entropy_diff	-0.014	59	0.989

\* Table no. 4  $p < 0.05$  comparing the pre and post scores using the Independent t Test.

For the between group, analysis the baseline was matched by subtracting the pre and post means. No significant changes were observed across the groups, which apparently shows that the immediate effects of mudras could be measured after a short term practice of five minutes, especially in a novice population, who did not practice mudras earlier. To confirm whether

duration of intervention had any influence in not finding statistical significance, we conducted another study on a small sample of 23 students, undergoing a short term one month yoga course. For this group, the mudra was prescribed for 15 minutes. This sample was also were not exposed to the earlier practice of mudras. The results are presented in table

5. No significant results were observed in this sample also.

Table 5: Paired sample t-test for Mudra group (study 3), with 15 minutes mudra practice showing the mean and standard score of Normalized Area, Area, Average Intensity and Entropy in Control group

Variable	Pre		Post		t-value	df	p-value
	Mean	SD	Mean	SD			
Normalised Area	2.2	0.65	2.06	0.68	1.1307	20	0.272
Area	9873.08	1617.32	9756.39	1979.3	0.3872	20	0.703
Average Intensity	75.38	4.26	74.64	5.33	0.8915	20	0.383
Entropy	2	0.07	1.95	0.13	1.5448	20	0.138

\* Table no. 5  $p < 0.05$  comparing the pre and post scores using the Paired t Test.

## 9.0 DISCUSSION

The objective of the first study was to examine whether attention, which causes an enhanced flow of prana to that region, causes changes in EPI parameters. We found that, area, normalised area, and average intensity of EPI image were enhanced after attention. This supports our hypothesis. These increases are also accompanied by an increase in entropy, which is a degree of disorder in the system, which may be due to enhanced flow of prana, which might have caused a

local increase in entropy. However, none of the results were statistically significant, probably due to lack of power (low sample size).

In the study 2, the same trends were observed. Area and average intensity showed significant changes, whereas normalized area and entropy did not. Control group results were also exactly similar to that of the experimental group. Further between groups analysis did not show any significance in any of the variables. From the obtained results, it is difficult to conclude about the efficacy of mudras. However, a uniform trend in the results suggests that, magnitude of effect of mudras may be small. In an earlier study (Raghuraj, Nagarathna, Nagendra, & Telles, 1997) showed no change in hand grip strength in mudra group, which shows the effects of mudras are weak to be immediately measured at the physical level. To confirm if duration of mudra had any effect, 15 minutes mudra was given to a sample of novices, who did not practice mudras earlier. The fact that, we could not observe any statistical significance, in spite of increasing the practice duration, we cannot ascertain mudras actual efficacy at this stage. It suggests that preliminary training in the practice of mudras is quite essential, and without that the study is incomplete. However, this study has given valuable inputs for further exploration in this direction. This study being the first study to evaluate scientifically the effects of mudras using EPI technique, has given useful insights towards the design of experiments for future studies. We suggest that in future studies, the duration of mudra practice may be increased to at least 10 to 15 minutes. Orientation towards the practice of mudra is highly recommended as participants should feel the finer aspects of mudra practice, which cannot be accomplished by mere one time demonstration of the practice, and needs a little time, at least a minimum of weeks' time. As this study on novices found a low effect size, sample size may also be increased to achieve required power. Optimizing the duration of mudra practice and duration of orientation could be the next immediate research. Later words can focus on study of specific mudras on specific body organs or a particular system, which is possible using GDV. Hence we conclude that use of mudras may be studied effectively using EPI based GDV systems, and research in this area in necessary as it would give the concrete scientific basis of practice of mudras.

## 10.0 APPRAISAL

### 10.1 SUMMARY AND CONCLUSION

The study showed that there is a change in area, normalized area, average intensity and entropy. All these EPI variables as measured by GDV were increased in study 1 and 2. This may indicate the effect of practice of attention and mudras. However, as the results were not statistically significant across the groups (mudra vs. control), the results are inconclusive at this stage. The main reason for not finding significant changes is attributed to lack of orientation in practice of mudras, due to which the observed low effect was seen. To conclude by highlighting that mudras would have subtle effects, and its immediate effects also can be studied but by taking necessary conditions into considerations.

## 10.2 IMPLICATIONS AND APPLICATIONS OF THE STUDY

This study, the first of its kind using EPI technique, has thrown light into the benefits of mudras, indicating that by the practice of mudras, the body's energy level can be changed and has thus, a valuable place in the field of therapy especially. The implications of practicing mudras during yogic practices could be seen not only for curative purposes but even preventive purposes too. In the modern day of stress, individuals are usually drained out of energy in the physical, mental and emotional aspects. With safe and effective yogic practices like that of mudras, a great change in the stress levels could be brought about. With the scientific knowledge of the benefits of mudras, its practice becomes more effective and helps it to establish itself more firmly in yoga sessions with a wider understanding.

## 10.3 STRENGTH OF THE STUDY

The main strength of the study is that so far, a study involving the practice of mudras and its measurement with the help of GDV is first of its kind. All aspects of energy levels with regards to GDV were used for assessing pre post changes in the practice of prana mudra. A pilot study prior to the testing of the prana mudra was done in which the attention and the body's energy flow were assessed. A well regulated study which involved two groups (control and experimental) were present and readings were taken before and after the practice in each group, which indicated the effects of prana mudra evidently.

## 10.4 LIMITATIONS OF THE STUDY

The time duration of the practice of mudra for the study was limited to 5 minutes which was not based on any previous research or scriptural references. The sample size used for the study was randomly selected as there were no earlier studies done on the subject. Also, during the inclusion of subjects for the study, there was a lack of uniformity in recruiting the subjects; there was a mixture of individuals from varying backgrounds like yoga and Ayurveda which might have altered the outcome of the study. No previous training of mudras was given, which is very essential as brought out from study 2 and 3. In the use of GDV instrument, as it possesses very highly sensitive machinery, individuals who become temporarily anxious could significantly influence the readings of the GDV, this aspect was not specifically taken care though general instructions were given and precautionary steps were taken.

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