CHAPTER 6

AN OVERVIEW OF RESEARCH EXPERIMENTS DONE ON *DHĀRAṆA* AND *DHYĀNA* BY *ANVEṢAṆA* SVYASA UNIVERSITY

AN OVERVIEW OF RESEARCH EXPERIMENTS DONE ON *DHĀRAṆA* AND *DHYĀNA* BY *ANVEṢAṆA* SVYASA UNIVERSITY

6.0 INTRODUCTION

Sage Patañjali describes eight limbs of *Yoga* namely *Yama, Niyama, Āsana, Prāṇāyāma, Pratyāhāra, Dhāraṇa, Dhyāna* and *Samādhi*.

***(Yama-niyama-āsana-prāṇayama-pratyāhāra-dhāraṇa-dhyāna-samādhayo-asṭavangani*|**

(PYS II.29).

Yama-s and *Niyama-s* are five in number and are physical and moral restraints which a spiritual seeker should practice before entering into serious meditation. Non-killing, truthfulness, non-stealing, continence and non-receiving are called *Yama* (Vivekananda, Swami, 1976). Internal and external purification, contentment, mortification, self study and worship of God are the *Niyama-s* (*Saucha santoṣa-tapa-svādhya-iśvaraprāṇidhāṇani niyamaha* I PYS II. 32, Ibid, p. 206). The first five limbs are called *Bahiraṅga Yoga* where as the last three are called *Āṅtaraṅga Yoga*. Comfortable sitting posture is called *Āsana* (*Sthirasukham āsanam* |). *Prāṇāyāma* means inhalation and exhalation of psychic breath (*Prachardana vidāraṇābhyam va prāṇasya* |). *Pratyāhāra* means withdrawal of organs. *Dhāraṇa* is holding the mind on to some particular object (*Deśabandha-cittasya dhāraṇa* | PYS III. 1. p. 218.) An unbroken flow of knowledge in that object is *Dhyāna* (PYS III.2. p.218). When that, giving up all forms, reflects only the meaning, it is *Samādhi*.

(Tadevaṛthamatra-nirbhaṣam svarupaśunyamīva samādhīhi PYS III. 1. p. 218.)

Once *Pratyāhāra* is established, the practitioner should concentrate his mind with one pointedness (*ekāgratā*). Then the mind – stuff (*Citta*) is confined and limited to a certain place. It is called *Dhāraṇa* (Vivekananda, Swami, 1976). Then all external ideas gushing into the mind will be stopped and it gets stabilized. When *Dhāraṇa* gets intensified, it is transformed into *Dhyāna*. Initially one should concentrate on gross objects, move into subtle

objects and finally become objectless. At that time, practitioner gains control over the mind and gets some miraculous powers. As Swami Vivekananda remarks '*the glory of the soul, undisturbed by the distractions of the mind or motions of the body, will shine in its full effulgence*" (Ibid).

Meditation or *Dhyāna* is a state of mental training through which spiritual seekers try to make their effort in increasing awareness of their mental process and establish mental stability. It is observed that meditation practice over a pretty length of time produces definite changes in practical attention and cognition (Brown P P). Meditation (*Dhyāna*) is considered as state of a specific consciousness in which deep relaxation and internal attention exist at the same time. The *Bhagvadgīta* says that when the mind is not in meditation, it is in a state of fickleness or random thinking (*cancalatā*) and focused attention (*ekāgratā*) (*Gīta* VI 12, 34).

The researchers namely Dr. R Nagarathna, Dr. Shirley Telles, Dr. N K Manjunatha Sharma, Dr. Deepeshwar Singh and others undertook studies at the SVYASA research Laboratory called *Anveṣaṇa* under the guidance of *Yoga* Scientist Dr. H R Nagendra on *Dhāraṇa* and *Dhyāna* along with studies on *cancalatā* and *ekāgratā*. These two aspects were studied for evaluating auditory information processing from the cochlear nerve at the periphery in association with cortices. This was chosen as it would not disturb the meditator during practice. The researchers studied the evoked potentials covering brainstem, mid latency and long latency after verifying the amplitude of these nerves. They applied statistical analyses and included sessions such as random thinking, non-meditative focused thinking, meditative focusing and meditation states before, during, and after the brainstem auditory evoked potentials providing objective physiological levels.

The recordings showed significance increase during *dhāraṇa*, *ekāgratā*, and *cancalatā*, sessions and not much of change during *dhyāna* practices. The results also denoted that *dhyāna* practice does not delay the auditory sensory transmission at brainstem levels but delay was shown at auditory information transmission and also at primary auditory courses (Singh Deepeshwar and Shirley Telles 1).

There were peak amplitudes of p1, p2 waves during *cancalatā a*nd non-meditation complex, and anterior singulate contacts respectively. This study and research showed that there was a decreasing brainstem auditory evoked potential suggesting the reduction of the speed of the transmission in the midway (inferior colliculous). There was also reduction of speed of

transmission at mid latency region and there was an involvement of large area within the auditory association contacts. The study also suggested that there was an improved attention for the auditory odd-ball, hence it was summarized that the meditation is a distinctive state in which auditory stimulate improves whereas the speed of auditory information up to the primary level appears to be slowed (Singh Deepeshwar and Shirley Telles 2).

In another study on *dhāraṇa, dhyāna, cancalatā,* and *ekāgratā,* it was observed that the physiological effects of those states were assessed using automatic variables, evoked potentials, functional magnetic resonance imaging (FMRI) and performance in cancellation tasks. These studies were carried on healthy male volunteers in the age group of 20 to 55 years. All were at a *Yoga* centre and were actively engaged in studying and practicing *yoga* and they had normal health based on routine chemical examination. They were instructed to meditate on own along with practice of *dhāraṇa* and *dhyāna.* They were given three months orientation course by a qualified *yoga* instructor and these participants were assessed and four sessions for four separate days at the same time. Their experience and ability was based on self reports and in consultation with a *yoga* teacher. It was formed in an earlier study that the cerebral cortex activity was involved in meditation (Lazar.et.al.2005, 3).

It was observed that the peak latency of a specific component, the wave v increases significantly all those four sessions, but there was no change during the practice of *dhyāna*. It was noted that the *dhāraṇa* practice was associated with delay and also with practices of *ekāgratā* and *Cancalatā* and also when functional magnetic resonance imaging studies showed that left Para hippocampus gyrus was activated in *ekāgratā* which is concerned with the formation of spatial memory, there was also bilateral fusi-form gyri activation which is correlated with face and body recognition, recognition of numbers, words, and abstraction of concepts (Thomas, et, al, 2009, 4).

The presence study also included the performance of a six letter cancellation task which was assisted, before and after four practices. This task assisted selective attention and concentration. The results showed that the participants who are focusing on the symbol '*OM*' and favorable effect on selective attention, concentration, visualization, scanning abilities and repetitive motor responses. So, there was difference between *dhāraṇa* and *dhyāna* meditative states (Shirley Telles, 5).

In another study on meditation on own, significant analyses were done with respect to

physiological alertness and increased sensitivity to sensory transmission, it is already referred to in the verses of *Māṇḍūkya Upaniṣad* that the three letters of '*OM*' represents the entire deep sleep stage, and it is symbolic of the past, present and future. It is also explained that all other sounds and things originate from *Omkāra* (Ibid 6).

There were scientific studies on '*OM*' and the meditators were suggested to concentrate on a picture of symbol '*OM*' and then asked to chant '*OM*' mentally and effortlessly. This resulted in a state of devoid of effort and focused attention which was characterized by blissful awareness. The automatic and respiratory variables were studied in experienced '*OM*' meditators who had an experience of 5-20 years in recitation of *Omkāra* and were subjected to meditation and control.

It was observed that there was a significant reduction in the heart rate during meditation compared to the controlled period. It was noted that there was a comparable increase in the peripheral vascular region which was considered as a sign of increased mental alertness (Ibid 7).

It was identified that the repetition of '*OM*' reduced skin resistance which denoted certain changes in the mental state (Ibid 8). This study observed that there was a significant cognitive involvement and a combination of mental alertness with periodic, physiological rest during '*OM*' meditation practices (Ibid 9).

A control study on the meditate effects of cyclic meditation on mindfulness state in normal healthy volunteers was done by Kumar S, Deepeshwar Singh, Naveen K V, and H R Nagendra (10). They evaluated the initial impact of meditation practice on mindfulness employing Mindfulness Attention Awareness Scale (MASS). According to this research study, higher scores in the single meditation group associated with a single factor of mindfulness were known to be associated with lower mode distance and stress.

Neuro-imaging studies showed changes in activation of pre-frontal cortex (PFC) and anterior singular cortex and which increased significantly Alpha and Beta activities during meditation. (Indian Journal of positive psychology, 2014, 5(4) 403, Ref: http://www.lahrw.com/index.php/home/jornal.details/19#list).

In another study covering long latency auditory evoked potentials (LLAEP) done by Shirley

Telles, Deepeshwar Singh, K V Naveen, and Subramanya Pailoor (11), the auditory sensory path way has been studied in people engaged in meditation using mid latency and short latency auditory evoked potentials and the participants were assessed in four mental states based on descriptions in the traditional yogic texts including *Māṇḍūkya Upaniṣad*.

The research suggested that deep meditation helps in processing of auditory information in the auditory association cortex, random thinking and it also helped in non - meditation, meditative focusing, which related in fewer regions, being recurred in auditory association areas (Clinical EEG and Neuro Science page,1-12,EEG and clinical Neuro science society, ECNS, 2014).

In one of the studies covering "*OM*" meditation with relevance from *Yoga* texts and contemporary science, researchers were exploring the significance of the syllable *OM* from ancient *yoga* texts and effects; they were also comparing these studies with contemporary science. They collected the ideas from *Munduka Upaniṣad*, *Māṇḍūkya Upaniṣad*, *Śvetāśvatara Upaniṣad* and Patañjali *yoga sūtra-s*. They instructed the meditators to first concentrate on a picture of *OM*, and asked them to chant the *Omkāra* mentally having imagined that picture in the mind. This process led to a state of effortlessness, focusing, and a place of blissful awareness.

The researchers studied the autonomic and respiratory variables of *OM* meditations, which had meditation experience ranging from 5 to 20 yrs. The study showed that the heart rate reduced during actual meditation in comparison during control period, during the meditation and control periods, there was a considerable increase in the cutaneous peripheral vascular resistance. This was constructed as a sign of increased mental alertness when the meditators were relaxed.

In another study related to middle latency auditory evoked potentials, participants were examined in meditators before and during "*OM*" meditation practice. This study helped in knowing how neural processing at various levels may change during meditation practice in which an idea, a thought or a word, was employed and it was observed that there was very minute but consistent reduction in the peck latency of the Nb wave was seen. These results denoted that during meditation neural processing at the middle latency auditory evoked potentials changed with changes in neural activities.

The research concluded that "*OM*" meditation with its three letters of *A.U.M.* and scientific studies suggested physiological alertness, increased sensitivity and synchronous biorhythms and sensitive sensory transmission (*Meditation on OM relevance from ancient text and contemporary science* by Sanjay Kumar, H R Nagendra, N K Manjunath, K V Naveen, Shirely Telles, IJOY (vol 3 Jan-Jun, 2010, pp.1-5, 12).

In another study covering Neural correlates of working memory following the practice of meditation, a high – density EEG study revealed that by using meditation as a technique practiced by practicing for at least one year showed enhancement in their memory potentials. They were randomly tested for cyclic meditation (CM) and with supine rest on two separated days, the participants exhibited sorter latency and significantly higher amplitudes following meditation practices. The regions of the brain which were having highest activation during this practice of meditation were fusiform gyrus, paralippocampal gyrus, middle occipital gyrus and the uncus (Neuroscience, http;/www.abstracts online.com).

A number of research studies have been done for finding positive physiological and psychological changes during meditation all over the world. There were studies for analyzing meditation techniques and corresponding EEG patterns and three categories were described thus:

1. Focused attention, which involves voluntary and sustained attention on chosen object.
2. Open monitoring meditation in which there is non - reactive monitoring of the moment to moment content of the experience and finally automatic self- transcending which included several techniques. The participants were subjected to four mental states namely *cancalatā* (Random thinking), *ekāgratā* (non-meditative concentration), *dhāraṇa* (focused meditation), *dhyāna* (defocused meditation). It was found that *dhāraṇa* scored on the visual Analog scale in relation to *cancalatā*, *ekāgratā*, and *dhyāna;* hence it was found that *dhāraṇa* was the most difficult of the states.

Actually the practice of *dhāraṇa* involves mental visualizations and tense focusing on the Sanskrit mystic syllable "*OM*". This meditation has shown activation in the brain region exposed to monitoring vigilance and dis - engaging attention from stimuli which may distract attention; therefore it is clear that the brain areas involved in these four mental states are quite different. The result of the studies showed that *cancalatā*, *ekāgratā* and *dhyāna* can be done

with equal case and *Dhāraṇa* is the most difficult state compared to the *cancalatā, ekāgratā* and *dhyāna* states.

In another study covering meditative focusing (*dhāraṇa*) and state of mental expansiveness (*dhyāna*), random thinking (*cancalatā*) and one pointed focusing (*ekāgratā*) research was done and assessed using autonomic variables evoked potentials and functional magnetic resource imaging (FMRI) .

The autonomic variables included heart rate, heart rate variables, skin resistance, finger amplitude and breathe rates. Assessment was done before the participants started the trail, for five minutes, twenty minutes, during the trail, and five minutes at the end all the four meditative states were covered as it was found out that, there was an increasing skin resistance level during *cancalatā* and *ekāgratā* with sympathetic activity. There was decrease in breath rate during *dhyāna* state with increased relaxation. It was also observed that wave V significantly increased during *dhāraṇa, ekāgratā, and cancalatā* stages. There was no change of wave V during the practice of *dhyāna.* It was also learned from earlier studies that wave V increased corresponding to the inferior colliculi located in the mid-brain.

These studies showed differences between *dhāraṇa* and *dhyāna* meditative stages and the findings were based on the description as given in the ancient *yoga* texts. It was observed that understanding of the descriptions of meditative states may help further in contemporary research finding (Shirley Telles and Bhat Ramchandra Raghavendra, 12).

Neuro physiological changes in meditation correlated with description from the ancient Texts Association for applied Psychological Physiology and biofeed back, www.aapb.org,biofeedback volume 39, issue 2, pp. 56-59 Dol.10, 5298/108/-5937-39.2.08 (16)**.**

Mindfulness refers to an awareness that emerges by paying attention to purpose and to the present movement and non judge mentally focusing on the unfolding of one's immediate experience (Brown K W, Ryan RM, 17). Mindfulness currently has been proposed as cognitive behavior rather than as physiological one. It helps a person to develop enhance awareness of the moment to moment experience of perishable mental process in the current study titled "Self-reported measures of mindfulness in meditate: Across sectional study".

133 healthy male volunteers comprising of 66 meditators and 67 non-meditators whose age ranging from 25 to 35 years selected from SVYASA Yoga University Bangalore, along with non meditators who were selected from similar institutions in India. Meditators had minimum three years experience in meditation where as non-meditators had no experience to any type of yogic practices and were totally unaware of the aims. For research study purposes, standard questionnaire was distributed in a class room set-up for 30 minutes and all the participants filled out the questionnaire and the participant were PG students. The researchers assessed mindfulness using the popular MAAS Technique (Mindfulness Attention Awareness Scale). This is a 15 item self- reported single factor Scale which exclusively focuses on attention\ awareness, component of mindfulness construct. This instrument has been used on individuals. The collected data was analyzed and the MAAS score was significantly higher in meditators as composed to with the non-meditators. This study showed that there was a positive correlation between levels of meditation practice and the levels of mindfulness.

The Cyclic Meditation (CM) developed by Yoga scientist Dr. H.R. Nagendra involved physical postures (*āsanas*) breath-work, physical and mental awareness together leading to a state of meditation (Nagendra H.R, Nagaratna R,14). The mindfulness develops as a result of consistence practice or attempt of meditation and according to Patañjali, state of mindfulness is *aṅtaraṅga yoga*.

6.1 CONCLUSION

The results obtained by the researchers at SVYASA were in closed accordance with the Patañjali *Yoga sūtras*' concept of the development of mindfulness. It is found out that the duration of the meditation practice and that of mindfulness during cyclic meditation, would lead to positive correlation between levels of mindfulness and duration of meditation practice.

Previous studies of mindfulness being analyzed with the help of several neuro-imaging and Electro Encephalography (EEG), Event Related Potentials (ERP) studies have shown changes in activation of pre-frontal cortex (PFC) and the anterior cingulated cortex (ACC) as well as significant increases in alpha and theta activity during meditation.

This pattern of activation is commonly associated with meditation and relaxation (Chan B.R, Polich J, 15), meditation status and traits, EEG, ERP and neuro-imaging studies (Psychol

Bull, 2006:132:180-211, 15).

There is enough evidence of changes in PFC during mindfulness meditation, which is associated with attention, concentration and emotion regulation. There have been other studies covering brain related self-awareness whose findings show a great promise for the individual's ability to train the mind which not only changes the emotional experiences but also structure of the brain and its functioning**.**

6.2 SUMMARY

In the sixth chapter titled '*Anveṣaṇa* Research done on *Dhāraṇa* and *Dhyāna* at SVYASA University' an analysis of the results obtained by the researchers at SVYASA was done and it was found that they were in close accordance with the Patañjali *Yoga sūtra*'s concept of the development of mindfulness. It is found out that the duration of the meditation practice and that of mindfulness during cyclic meditation, would lead to positive correlation between level of mindfulness and duration of meditation practice.

****