REVIEW OF LITERATURE

STRESS

HOMEOSTATIC PROCESSES TO COPE WITH STRESS

SEQULE OF STRESS

MEDITATION

TYPES OF MEDITATION

COMPONENTS OF MEDITATION

MEDITATION RESEARCH- HISTORY AND CURRENT STATUS

CHANGES DURING MEDITATION
STRESS

HOMEOSTATIC PROCESSES TO COPE WITH STRESS
Irrespective of the cause and definitions, stress produces homeostatic responses in the body to cope with it. The brain is the master controller of the interpretation of what is stressful and also of the behavioral and psychological responses to be produced. A brief period of controllable stress may be harmless for physical and mental health but exposure to long term stress may lead to chronic state of distress which may enhance vulnerability to stress related diseases.

Stress and the Brain:
Stressful stimuli reach the central nervous system through

1. somatosensory pathways
2. viscerosensory pathways
(Through spinal or brainstem sensory neurons).
In general, stress responses can be divided into

a. Short circuit (spinal stress responses based on spinal reflexes)

b. Long circuit (supraspinal stress responses consisting of higher centers such as the neuroendocrine hypothalamus, the limbic system, and the cerebral cortex).
The maintenance of homeostasis requires precise coordination of autonomic, neuroendocrine, and behavioral responses to adjust to the changes in the internal and external environments.

The output system in stress involves two major routes:

a. Neuronal (carried by either somatomotor or visceromotor (autonomic) fibers in the cranial or peripheral nerves)

b. Neuroendocrine.

Both the motor and autonomic stress responses finally arise from brainstem or spinal neurons. The modulatory centers are hypothalamus, limbic system & neocortex which have no direct neuronal outputs to the periphery, but they may exert their effects through actions on brainstem or spinal motor or autonomic neurons. The hypothalamus has a special neuroendocrine output route, the neurohumoral hypothalamo-pituitary system, which is involved in a prominent fashion in stress responses.

Although the HPA axis is the most representative and probably the most effective neuroendocrine regulatory pathway in the stress response, hypothalamo-pituitary control of other endocrine organs, as well as control of body fluid and mineral homeostasis and food intake, also constitute important regulatory circuits that are involved in the organization of responses to stressful stimuli (Karl Pacak 2001).
An immediate response to stress occurs through the sympathetic Adreno-Medullary Pathway (also known as active coping) leading to release of adrenaline and long-term response to stress stimulates the Adreno-Cortical pathway (also known as the passive coping) which leads to the release of Corticotrophin Releasing Hormone (CRH) which stimulates the release of cortisol from the adrenal cortex.
SEQUELAE OF STRESS

Stress and Adrenaline – The Stress Hormone

Through the HPA modulated pathway, on exposure to stress, release of the major stress hormone adrenaline occurs. Several studies have looked at the effect of adrenaline on the body. Goldenberg et al. in 1948 found that adrenaline raised the systolic and the mean pressure but had little effect on the diastolic pressure, noradrenaline raised systolic, mean and diastolic pressures. He also studied the two most important factors determining the blood pressure—the cardiac output and peripheral resistance. Adrenaline increased cardiac output considerably but caused an overall peripheral vasodilatation with no change in diastolic pressure. Adrenaline was found to cause hyperventilation and palpitation (Barcroft and h. Konzett 1948). Studies show that adrenaline increases the heart rate by increasing the slow inward (Ca\(^{2+}/\text{Na}^{+}\)) current (Brown, H. F. & Noble 1974, Reuter H), in the sinus region (Kohlhardt, M1976, Brown H. F 1979, 78). In the voltage clamp experiments in rabbits by HF Brown (1979) it was found that adrenaline increases the slow inward current in the SA node, but that it also augments the outward current which would tend to decelerate pacemaker depolarisation. R. F. Whelan and I. Maureen Young (1953) found increase in the Respiratory rate and depth of the respiration especially during the first few minutes of the infusion period of adrenaline. This was usually accompanied by a feeling of tightness in the chest. So, prolonged exposure to stress may lead to the changes which would finally affect the normal health of an individual.
Stress and Corticotropin Releasing Hormone

Maintenance of adequate levels of response of the hypothalmo-pituitary-adrenal axis during chronic stress is important for survival. Three basic patterns of response can be identified depending on the type of stress: (a) desensitization of ACTH responses to the sustained stimulus, but hyper responsiveness to a novel stress despite elevated plasma glucocorticoid levels, as occurs in physical-psychological paradigms; (b) no desensitization of ACTH response to the repeated stimulus and hyper responsiveness to a novel stress, as occurs during repeated painful stress and insulin hypoglycemia; and (c) small and transient increases in ACTH, but sustained elevations of plasma corticosterone and diminished ACTH responses. The level of response of the pituitary corticotroph is determined by differential regulation of the hypothalamic regulators, Corticotrophin Releasing Hormone (CRH) and vasopressin (VP), and the sensitivity of the negative glucocorticoid feedback. While osmotic stimulation increases VP expression in magnocellular neurons of the paraventricular (PVN) and supraoptic nuclei of the hypothalamus, chronic stress paradigms with high pituitary responsiveness are associated with activation of CRH and CRH/VP parvocellular neurons of the Para Ventricular Nucleus (PVN), predominantly of the VP-containing population. While moderate increase of CRH output is important for stimulation of Pro Opio Melano Cortin (POMC) transcription, the increase of the VP: CRH secretion
ratio appears to be important in maintaining the secretory capacity of the pituitary corticotroph during chronic stimulation. Decreased sensitivity of the glucocorticoid feedback, probably due to interaction of glucocorticoid receptors with transcription factors induced by CRH and VP, is critical for the maintenance of ACTH responses in the presence of elevated plasma glucocorticoid levels during chronic stress. Although both CRH and VP receptors are activated and undergo regulatory variations during chronic stress, only the changes in VP receptor levels are parallel to the changes in pituitary ACTH responsiveness. The inhibitory effect of chronic osmotic stimulation on ACTH secretion in spite of high circulating levels of VP is probably the result of diminished activity or parvocellular neurons (PVN) and down regulation of pituitary VP receptors. Although the exact interaction between regulatory factors and the molecular mechanisms controlling the sensitivity of the corticotroph during adaptation to chronic stress remain to be determined, it is clear that regulation of the proportional secretion of CRH and VP in the PVN, modulation of pituitary VP receptors, and the sensitivity to feedback inhibition play a critical role. (Greti1994)

Stress and Cortisol – The Stress Hormone
According to Spalosky (1985, 1990) and co workers, upon exposure to stressors, glucocorticoids are released and act on target cells including brain cells. This central action of glucocorticoids is associated with behavioural, neurochemical, and neurodegenerative changes. Neurodegenerative changes are of great importance since they occur in the hippocampus, one of the brain regions involved in memory processes and other cognitive functions as well as in the regulation of the HPA axis (Herman et al 1989, Herman et al 1996). Prolonged exposure to high glucocorticoid levels, as commonly seen upon exposure to chronic stress, causes premature age related changes in hippocampal electrical activity (Kerr 1991). It also causes dendritic and neuronal atrophy upon exposure to hypoxia (Sapolsky 1990). Glucocorticoids evoke responses that are neuroprotective during exposure to stress (Nicholas 1996). Cortisol increases gluconeogenesis and fat utilization as an immediate effect and on chronic release cause a different pattern of fat accumulation leading to obesity.

**Stress and GABA - The inhibitory neurotransmitter**

In an Immunohistochemical analysis the presence of Gamma-Amino Butyric Acid (GABA)-containing fibers and GABA-containing chromaffin cells in canine adrenal glands was documented. A dense network of fibers was visualized at the boundary between medullary and cortical cells and in the medullary tissue, GABA-containing fibers surrounded chromaffin cells. The functional role of the GABAergic system in the regulation of catecholamine
release from adrenal chromaffin cells was studied in canine adrenal glands in situ, using an autoperfusion system for the adrenal gland that was designed to eliminate indirect central effects of drugs or their metabolites on catecholamine release. It was found that GABA modulates the spontaneous release of catecholamines and the release elicited by electrical stimulation of the splanchnic nerve. (Kataoka Y).

**Stress and Immunity**

As sympathetic fibers descend from the brain into both primary (bone marrow and thymus) and secondary (spleen and lymph nodes) lymphoid tissues (Felten & Felten, 1994), these fibers can release a wide variety of substances that influence immune responses by binding to receptors on white blood cells (Ader, Cohen, & Felten 1995) and affect the immune response of the body to stress. Two kinds of immune assays available to assess immune changes are:

1. The primary enumerative assay that simply counts the numbers or percentages of different kinds of white blood cells in the peripheral blood.
2. Second enumerative technique that quantifies the amount of antibody (or Immunoglobulin) in the saliva (salivary immunoglobulin A (IgA)) or circulating in the peripheral blood (serum IgA, IgG, and IgM).

Immunoglobulin A are protein molecules produced by B cells that recognize and bind to a specific antigen. They attach to antigen, mark it for destruction and prevent it from causing infections. IgA, IgG, and IgM represent different types of antibody molecules, each with a specific function. IgA is primarily
present in mucous secretions (e.g., salivary, nasal, genital) to combat entry of antigen into the body, while IgM and IgG are found primarily in peripheral blood.

Salivary IgA has particular appeal as a potential biomarker because (i) It can be obtained noninvasively, easily, and frequently in comparison with blood, (ii) it is biologically relevant as a functional immune end point, (iii) It can be quantitated, and (iv) It is more stable, with a longer biological half-life, than cortisol and catecholamine.

IgA is a better indicator in stress as it plays an important role in local immunity and activation of the complimentary pathway in the immune response (GM Henningsen 1992).
COMPONENTS OF MEDITATION

The Agency for Healthcare Research and Quality U.S., Department of Health and Human Services accepts the following as main components of meditation and based on this meditation has been divided into 5 categories.

Main Components of meditation

The main components of any meditation practice or technique refer to specific postures, the use of a mantra, breathing, a focus of attention, and an accompanying belief system.

**Posture** refers to the position of the body assumed for the purpose of meditation. Though traditional meditation practices prescribe particular postures (e.g., the lotus position), postures vary between practices with the only limitation being that the posture does not encourage sleep. (Carrington P 1977).

**Breathing** in meditation can be incorporated passively or actively. In passive breathing, no conscious control is exerted over inhalation and exhalation and breathing is “natural.” In contrast, active breathing involves the conscious control over inhalation and exhalation. This may involve controlling the way in which air is drawn in (e.g., through the mouth or nostrils), the rate (e.g., drawn
in quickly or over a specified length of time), the depth (e.g., shallow or deep), and the control of other body parts (e.g., relaxation of the abdomen).

**Mantra** is a distinctive feature of some meditation practices. A mantra is a sound, word, or phrase that is recited repetitively, usually in an unvarying tone, and used as an object of concentration. The mantra may be chanted aloud, or recited silently.

Mantras can be associated with particular historical or archetypal figures from spiritual or religious systems, or they may have no such associations (Kaplan S 2001).

**Relaxation** is often considered to be one of the defining characteristics of meditation practices and meditation itself is often considered to be a relaxation technique (Chang JC 2001, Wang HM 2000, Benson H 1975). Indeed, it has been suggested that the popularity of meditation practices in the West is due, at least in part, to the widely accepted plausibility of their alleged effects with respect to arousal reduction (Holmes DS 1984). Some researchers have attempted to draw a distinction between relaxation and meditation practices on the basis of intention (Tloczynski J 1998).

**Attention and its object** is considered crucial to the practice of meditation, as is the development of an awareness in which thoughts do not necessarily disappear, but are simply not encouraged by dwelling on them, a state of so-called “thoughtless awareness.” (Sri Swami Sivinanda 1975, Sagula DA. 2000).

**Spirituality and belief** refers to the extent to which spirituality and belief systems are a part of meditation practices. Spirituality and belief systems are
composed of metaphysical concepts and the rules or guidelines for behavior (e.g., devotional practices or interpersonal relations) that are based on these concepts.

**Training** refers to the recommended frequency and duration of periods of practice, and how long a practitioner is expected to train before being considered proficient in a given technique.

Five broad categories of meditation practices were identified in the scientific literature: Mantra meditation (comprising Transcendental Meditation® [TM®], Relaxation Response [RR], and Clinically Standardized Meditation [CSM]), mindfulness meditation (comprising Vipassana, Zen Buddhist meditation, Mindfulness-based Stress Reduction [MBSR], and Mindfulness-Based Cognitive Therapy [MBCT]), Yoga, Tai Chi, and Qi Gong.
TYPES OF MEDITATION

Based on the above mentioned components, meditation is broadly classified into five categories:

1. **Mantra Meditation** A mantra/word or phrase repeated aloud or silently and used to focus attention. Relaxation Response, Clinically Standardized Meditation and Transcendental Meditation are three types of mantra meditation.

   **Transcendental Meditation** TM® is a technique derived from the Vedic tradition of India by Maharishi Mahesh Yogi. (Alexander CN 1994) In TM®, a meditative state is purportedly achieved in which the repetition of the mantra no longer consciously occurs and instead the mind is quiet and without thought (Delmonte MM 1980).

   **Relaxation Response** The “relaxation response” is a term coined by Harvard cardiologist Herbert Benson in the early 1970s to refer to the self-induced reduction in the activity of the sympathetic nervous system, (Benson H 1975, Holmes DS 1984) the opposite of the hyperactivity of the nervous system associated with the fight or-flight response.

   **Clinically Standardized Meditation** (CSM) was developed by Patricia Carrington, is based on a classical Indian form of mantra meditation.

2. **Mindfulness Meditation** Mindfulness has been described as a process of bringing a certain quality of attention to moment-by-moment experience and as a combination of the self-regulation of attention with an attitude of curiosity,
openness, and acceptance toward one's experiences (Bishop SR 2004). Vipassana, Zen Buddhist Meditation, Mindfulness-Based Stress Reduction, Mindfulness-Based Cognitive Therapy are a few types of mindfulness meditation.

Vipassana Vipassana is the oldest of the Buddhist meditation techniques that include Zen (Soto and Rinzai schools) and Tibetan Tantra. (Salmon PG 2004, Gunaratana H 1993).

Zen Buddhist Meditation Zen Buddhist meditation, or Zazen originated in India several thousand years ago and was introduced to Japan from China in 1191 A.D. Zen Buddhist meditation is typically divided into the Rinzai and Soto schools.

Mindfulness-Based Stress Reduction The MBSR program emerged in 1979 as a way to integrate Buddhist mindfulness meditation into mainstream clinical medicine and psychology (Kabat-Zinn J 2003).

Mindfulness-Based Cognitive Therapy is a method for preventing relapse in patients with clinical depression; MBCT combines the principles of cognitive therapy with a framework of mindfulness to improve emotional well-being and mental health. (Bishop SR2004, Segal ZJ 2002).
3. **Yoga** The philosophy and practice of Yoga date back to ancient times, originating perhaps as early as 5,000 to 8,000 years ago (Brown RP 2005). Patanjali’s Yoga Sutras, are practical instructions for attaining certain psychological states (Baker MA 1979, Lohman R 1999). Yogic meditative techniques have been transmitted through Kundalini yoga, Sahaja yoga, Hatha yoga and other yogic lineages (Arias AJ 2006).

4. **Tai Chi** Though differing in focus on posture and the position of the center of gravity, all styles emphasize relaxation, mental concentration, and movement coordination (Fasko D Jr 2001). There are five main schools, or styles, of Tai Chi, each named for the style's founding family: Yang, Chen, Sun, Wu (Jian Qian), and Wu (Li F, Fisher 2003).

5. **Qi Gong** Qi Gong is classified as one of the practices known as “energy healing,” a category that includes Reiki, therapeutic touch, (Ai 2001) and the Korean practice of Chundosunbup.
MEDITATION RESEARCH- HISTORY AND CURRENT STATUS

The positive effects seen in the practitioners of meditation generated scientific curiosity and the first research paper on meditation was published in 1970 by Robert Keith Wallace “Physiological Effects of Transcendental Meditation”. Oxygen consumption, heart rate, skin resistance, and electroencephalograph measurements were recorded before, during, and after subjects practiced Transcendental meditation. There were significant changes between the control period and the meditation period in all measurements. During meditation, oxygen consumption and heart rate decreased, skin resistance increased, and the electroencephalogram showed specific changes in certain frequencies. These results initiated further research on TM and many more papers were published on substance abuse, self actualization and autonomic stability in the next two years (Wallace R.K 1972, Seeman W 1972, Nidich S 1973, Orme-Johnson D.W 1973).

After this nearly 600 studies have been published from 60 countries on TM. Most of the studies were on Cardiovascular Disease Risk Factors, Depression, Anxiety and Insomnia, Stress and Substance Abuse.

Transcendental Mediation® (TM) technique started getting acceptance from the scientific world as a possible means of countering effects of stress with altered levels of several hormones both during the practice and longitudinally after regular practice of this technique. In this prospective in 1972 PJ Russel conducted a random assignment study, to see changes from baseline levels and acute responses to laboratory stressors.
Four hormones, cortisol, growth hormone, thyroid-stimulating hormone and testosterone, were studied before and after 4 months of either the TM technique or a stress education control condition. Daily urine excretions of catecholamines and Vanillyl Mandelic Acid (VMA) were determined in ten male advanced meditators and ten male long-term meditators who were subjected four times to slight physical exercise following a period of rest, meditation or reading. Blood pressure and heart rate were measured continuously and blood samples were taken for plasma catecholamine levels immediately before and after the physical exercise and VMA excretions were greater in the TM group (R. Lang, 1979). Later in 2001 Morning and evening Catecholamine levels were studied in 19 regular practitioners of TM and control group and in the TM group it was lower than in the control (Jose Rafael Infante, 2001).

Lipid peroxidase levels were studied in 41 normal healthy adults who were long-term practitioners of the technique (Robert H. Schneider 1998) and serum lipid peroxidase levels were found to be significantly lower when compared to the control. Robert H. Schneider et al (1995) tested the short-term efficacy and feasibility of two stress education approaches to the treatment of mild hypertension in older African Americans. This was a randomized, controlled, single-blind trial with 3 months of follow-up in a primary care, inner-city health center on 127 individuals who were aged 55 to 85 years. The reductions in the Transcendental Meditation group were significantly greater than in the progressive muscle relaxation group for both systolic blood pressure and
diastolic blood pressure. The linear trend analysis also confirmed the reduction.
A preliminary investigation of the acute effects of TM on total peripheral
resistance was conducted and was found to be decreased significantly during
TM (Vernon A. Barnes 1999).

In 2007 Maxwell V. Rainforth conducted an updated systematic review of the
published literature and identified 107 studies on stress reduction and BP in
TM. Seventeen trials with 23 treatment comparisons and 960 participants with
elevated BP met criteria for well-designed randomized controlled trials and
replicated within intervention categories. Meta-analysis was used to calculate
BP changes for biofeedback, relaxation-assisted biofeedback, progressive
muscle relaxation, stress management training, and the Transcendental
Meditation program, results indicated that among stress reduction approaches,
the Transcendental Meditation program is associated with significant
reductions in BP. In 2008 (JW Anderson) full reports of randomized controlled
trials related to Transcendental Meditation and hypertension were meta-
analyzed and the random-effects meta-analysis model for systolic and diastolic
blood pressure, indicated that Transcendental Meditation, compared to control,
was associated with significant lowering of blood pressure. When the efficacy
of transcendental meditation (TM) was evaluated on components of the
metabolic syndrome and Coronary Heart Disease (CHD), use of TM for 16
weeks in CHD patients improved blood pressure and insulin resistance,
components of the metabolic syndrome, as well as cardiac autonomic nervous
system tone compared with a control group receiving health education (Maura Paul-Labrador 2006).

When 10 experienced male meditators and nine matched subjects, uninformed of the TM procedure, were compared, after 40 minutes of practice, no significant difference was seen between these 2 groups with respect to carbohydrate metabolism (plasma glucose, insulin and pancreatic glucagon concentrations), pituitary hormones (growth hormone and prolactin) or the 'stress' hormones, cortisol and total catecholamines, although meditators tended to have higher mean catecholamine levels. Plasma free fatty acids were significantly elevated in meditators (Cooper R 1985)

After TM, Mindfulness meditation stands second in medical research. A randomized, wait-list controlled study was conducted on cancer patients. Patients completed the Profile of Mood States and the Symptoms of Stress Inventory both before and after the intervention. The intervention consisted of a weekly meditation group lasting 1.5 hours for 7 weeks plus home meditation practice. After the intervention, patients in the treatment group had significantly lower scores on Total Mood Disturbance and subscales of depression, anxiety, anger, and confusion and more vigor than control subjects. The treatment group also had fewer overall symptoms of stress; fewer cardiopulmonary and gastrointestinal symptoms; less emotional irritability, depression, and cognitive disorganization; and fewer habitual patterns of stress (Michael Speca 2000).
Studies on Vipasana meditation showed the possible beneficial role of the technique in sleep–wakefulness behavior in adults (Sulekha S 2006).

Authors claim that yoga practices help to retain slow wave sleep and enhance the REM sleep state in middle age thus helping one to retain a younger biological age as far as sleep is concerned.

Brain electrical activity was measured before and immediately after, an 8-week training program in mindfulness meditation. Twenty-five subjects were tested in the meditation group. A wait-list control group was tested at the same points in time as the meditators. At the end of the 8-week period, subjects in both groups were vaccinated with influenza vaccine. There was significant increase in left-sided anterior activation, a pattern previously associated with positive affect, in the meditators compared with the nonmeditators. It was also found significantly increased in antibody titers to influenza vaccine among subjects in the meditation compared with those in the wait-list control group (Richard J Davidson 2003).

When the study was conducted on the effectiveness of Mindfulness-based stress reduction (MBSR) program, it was found to be associated with increase in mindfulness and spirituality. There were significant improvements in state and trait mindfulness, psychological distress, and reported medical symptoms. (Carmody 2008).
BRAIN CHANGES DURING MEDITATION

ACTIVATION OF THE PREFRONTAL AND CINGULATE CORTEX

Since meditation requires intense focus of attention, it seems appropriate that a model for meditation begin with activation of the Pre Frontal Cortex (PFC), particularly in the right hemisphere, as well as the cingulate gyrus.

THALAMIC ACTIVATION

Several animal studies have shown that the PFC, when activated, innervates the reticular nucleus of the thalamus (Cornwall J 1988), particularly as part of a more global attention network (Portas C M 1988). When excited, the reticular nucleus secretes the inhibitory neurotransmitter GABA onto the lateral geniculate nuclei, cutting off input to the PSPL and visual centers in proportion to the reticular activation (Destexhe A 1998). Several studies have hypothesized an increase in serum GABA during meditation (Elias A. N 1998).

PSPL DEAFFERENTATION

When deafferentation of the PSPL via the reticular nucleus’s GABA ergic occurs, an individual may begin to lose his or her usual ability to spatially define the self and help to orient the self.
HIPPOCAMPAL AND AMYGDALAR ACTIVATION

In addition to the complex corticothalamic activity, meditation might also be expected to alter activity in the limbic system, especially since stimulation of limbic structures is associated with experiences similar to those described during meditation (Fish D R 1993, Saver J L 1997).

HYPOTHALAMIC AND AUTONOMIC NERVOUS SYSTEM CHANGES

The hypothalamus is extensively interconnected with the limbic system. Stimulation of the right lateral amygdala has been shown to result in stimulation of the ventromedial portion of the hypothalamus with a subsequent stimulation of the peripheral parasympathetic system (Joseph R 1996). Increased parasympathetic activity is associated with the subjective sensation first of relaxation and, of a more profound quiescence (Newberg 2003).

Activation of the parasympathetic system would also cause a reduction in heart rate and respiratory rate. All of these physiological responses have been observed during meditation (Davis M 1992). When an individual’s breathing and heart rate slow down, the para gigantocellular nucleus of the medulla ceases to innervate the locus ceruleus (LC) of the pons. The paraventricular nucleus of the hypothalamus typically secretes corticotropin-releasing hormone
(CRH) in response to innervation by NE from the locus ceruleus (Jevning R 1992, Walton K G 1995). This CRH stimulates the anterior pituitary to release adreno-corticotropic hormone (ACTH) (Livesey J. H 2000). ACTH, in turn, stimulates the adrenal cortex to produce cortisol, one of the body’s stress hormones (Davies E 1985). Decreasing NE from the locus ceruleus during meditation would likely decrease the production of CRH by the paraventricular nucleus, which would ultimately decrease cortisol levels. Most studies have found that urine and plasma cortisol levels are decreased during meditation (Sudsuang R 1991, Jevning R 1978, Renaud L P 1996). The drop in blood pressure associated with para-sympathetic activity during meditation practices would be expected to relax the arterial baroreceptors leading the caudal ventral medulla to decrease its GABAergic inhibition of the supraoptic nucleus of the hypothalamus.
CHANGES DURING MEDITATION

- Sustained attention, Focussing
- PFC
- Cingulate gyrus
- Reticular nucleus of thalamus
- PSPL
- GABA
- Glutamate
- Hippocampus, amygdala
- Hypothalamus
- Decrease CRH, \( \downarrow \text{Symp.NS} \)
- Decrease HR, RR
- Decrease stimulation of LC
- Decrease ACTH
- Decrease Cortisol
- Decrease gluconeogenesis
CRITICISMS AND LACUNAE IN MEDITATION RESEARCH

The University of Alberta Evidence-based Practice Center (UAEPC) reviewed and synthesized the published literature on the state of the research of meditation practices for health.

State of Research on the Therapeutic Use of Meditation Practices in Healthcare

Eight hundred and thirteen studies provided evidence regarding the state of research on the therapeutic use of meditation practices. Half of the studies on meditation were published after 1994. Most of the studies were published as journal articles. Studies were conducted mainly in North America (61 percent). Of the 813 studies included, 67 percent were intervention studies (286 RCTs, 114 NRCTs and 147 before-and-after studies), and 33 percent were observational analytical studies (149 cohort and 117 cross-sectional studies).

Control groups in these studies: The number of control groups used in the 668 controlled studies ranged from one to four. The majority of the studies utilized an active, concurrent control.

Study population: The majority of studies on meditation practices have been conducted in healthy populations.

Outcome measures: Physiological functions, particularly cardiovascular outcomes, were the most frequently reported outcome of interest in meditation research. Psychosocial outcomes, outcomes related to clinical events and health
status, cognitive and neuropsychological functions, and healthcare utilization outcomes have also been evaluated in studies of meditation practices.

Results of the analysis: A few studies of overall poor methodological quality were available for each comparison in the meta-analysis, most of which reported no significant results.

The physiological and neuropsychological effects of meditation practices were evaluated in 311 studies. The majority of studies were conducted in healthy participants. Meta-analysis revealed that the most consistent and strongest physiological effects of meditation practices in healthy populations occur in the reduction of heart rate, blood pressure, and cholesterol. The strongest neuropsychological effect is in the increase of verbal creativity. There is also some evidence from before and after studies to support the hypothesis that certain meditation practices decrease visual reaction time, intraocular pressure, and increase breath holding time. The overall low methodological quality of the studies indicated that most of the studies suffered from methodological problems that may result in overestimations of the treatment effects or compromise the generalizability of the study results. Particularly, the lack of a concurrent control group in the before and after studies, results in an inability to control for temporal trends, regression to the mean, and sensitivity to methodological features.

So the current study was designed on a new meditation technique named Integrated Amrita Meditation technique designed and presented to the world by Her Holiness Mata Amritanandamayi Devi.
MATA AMRITANANDAMAYI MATH (MAM)

The Mata Amritanandamayi Math was established in 1982 at Mata Amritanandamayi devi’s (Amma’s) birthplace, Parayakadavu, a small fishing village on the Arabian Sea, 13 kms from Karunagappally, Kollam district, Kerala. The ashram is run by Amma’s monastic disciples and regularly holds spiritual discourses and classes. The devotees enjoy participating in the devotional singing meditation and chanting that take place daily. The Math has over 30 branches all over India and 60 branches across the world. Through these branches, the Math conducts various humanitarian activities such as medical camps, feeding the poor, distributing pensions, building free homes for the homeless and more.

INTEGRATED AMRITA MEDITATION TECHNIQUE

From ancient times up to the present day, an unbroken succession of Self-realized Masters has taken birth in India to lead seekers of Truth to the ultimate reality. Mata Amritanandamayi is known variously as a Humanitarian, Mother,
Friend, Guru, and God by the people. She is popularly known as Amma. She has offered herself to the world. In reality, She is beyond all such roles, her true nature is to be the true nature of all of us the blissful divine consciousness that pervades this universe. But out of her infinite compassion, Amma comes down to the level of whoever is standing before her the poor, the lonely, the seeker in order to give what is desired, what is needed.

IAM - Integrated Amrita Meditation Technique® is a powerful meditation technique created by Amma to help people find fulfillment in spiritual as well as materialistic life. It can be comfortably performed by anyone in just 23 minutes per day. The IAM - Integrated Amrita Meditation Technique® is protected under a registered trade mark in order to preserve the original form of this meditation designed and developed by Amma and to prevent misuse by unauthorized and unqualified teachers. Therefore, at the beginning of the course each participant is requested to sign an agreement that he or she shall keep the course, including all written materials received as part of the course, strictly confidential. This meditation course is meant only for a person of sound mental health.

Amma’s disciples teach the technique in all parts of the world. IAM Technique® is not only taught to Amma’s devotees, but also to organizations throughout the world, including corporations, education institutions and correctional facilities. Students of various Universities and the Indian Army have also been introduced to this technique.