Chapter - 2

Review of Literature
Literature search should reflect relevant information pertaining to the topic being studied. The information provided should put forward empirical evidence and theoretical formulations emerging there of in such a way that rationale for conducting the present work is clearly projected.

Role of stress, job strain, anger, overactivation of sympathetic nervous system and hormonal secretions in the etiology of cardiovascular disorders (hypertension and CHD) has been explained in detail in the 1st Chapter. These factors play an important role in the elevation of blood pressure and episodes of angina. Meditation like other strategies has been used to deal effectively with these pathologies. With the help of some empirical studies, role of meditation in dealing with hypertension and CHD by reducing stress, job strain, anger, overactivation of sympathetic nervous system and hormonal secretions is being highlighted, in this chapter.

Andersen and Jensine (2000) discussed Asian spiritual narratives on meditation together with medical and scientific narratives that emphasize meditations efficacy in mitigating distress and increasing well being. Among other positive outcomes, meditation has been credited with reducing blood pressure, anxiety, addiction and stress, while relaxation response has been shown to decrease sympathetic nervous system (SNS) activity, metabolism, pain, anxiety, depression, hostility and stress. It is concluded that while findings from cognitive neuroscience on the subject of visual imagery can be used to elucidate genres of meditative practice that focus on internal visualization sequences, certain integral aspects of meditation forever will remain beyond scientific grasp.
Barbieri and Patric (1996), discuss how becoming a more integral part of the healing process and getting to know oneself on a deeper level can lead to understanding the reasons why ineffective organised behaviours are chosen to deal with stressful situations. According to them mindfulness, an eastern meditation technique can be used to increase utilization of control theory. People would benefit from stress reduction technique by increasing their awareness of themselves. After they have learned to slowly bring in their fears and observe the behaviours they have used to repress them, they can learn how to stop the conflict within and transform and heal the mind and body.

In 1996, Smith and others investigated factors associated with Massage, Abreviated, Progressive Muscle Relaxation (PMR), Yoga Stretching, Imagery and Meditation amongst 940 practitioners, who describe their technique experience. Major relaxation related qualities were found namely ability to experience joyful affects and appraisals, being distant and calm, awareness, prayerfulness, acceptance, being untroubled and silent. Somatic specificity models predict calmness and non-tension, yoga stretching, breathing and meditation are associated with awareness. only meditation with prayerfulness and all techniques except PMR with joyful affect. Results are consistent with cognitive behavioural relaxation theory and have implications for relaxation theory, treatment, training, assessment and research. A revised model is presented with 3 global dimensions: tension-relief, passive-disengagement and passive engagement.
A pilot study was run to test the effectiveness of meditation, training for student teachers. This study was conducted by Winzelberg and others in 1999. Fifteen subjects (mean age 24.5 years) were assigned to either a meditation training or control group. Subjects in the meditation training were taught the RISE response, which includes a simple meditation technique using sound as a focusing device and three corollary techniques. The program prescribed a formal meditation practice period while the three corollary practices were to be used at any time to remind subjects to focus attention. Subjects assigned to the meditation group attended 4-5 min meditation training sessions. The meditation group subjects were found to significantly reduce their stress symptoms in the post-test measurements when compared to the control group in the domains of emotional manifestations, gastronomic distress and behavioural manifestation.

Anderson and others (1999) conducted a study in which they employed a pre-test post-test control group design to assess the effect of a 5-week standardized meditation (SM) class on the perceived occupational stress of 91 full time elementary, middle, and high school teachers (aged 22-60 years) from suburban districts in three states. Results offered support for the hypothesis that SM significantly reduces teachers' perceived stress. Teachers perceived a reduction in stress using SM only 2-5 times per week. The use of SM by school psychologists to assist in reducing teacher stress is discussed.

Beauchamp and others (1992) administered a scale to assess dysphoria anxiety, depression and hostility, positive affect and sensation
seeking among 126 subjects aged (25-50 years). Subjects also indicated their frequency of meditation. Frequent meditators reported significantly fewer stressors and illness symptoms; lower levels of anxiety, hostility, depression and dysphoria, and higher levels of positive affect and sensation seeking than did infrequent meditators. Frequent meditation was associated with reductions in the degree of correlation between stress and dysphoria and between illness symptoms and dysphoria. Thus for frequent meditators, increased stress and illness symptoms were not necessarily accompanied by increased negative affect.

Three studies giving evidence on the effects of meditation practice on employees' health in the work setting were reviewed by Delmonte & Michael (1984). They found that meditators reported more job satisfaction, improved performance, less desire to change jobs, better interpersonal relationships and decreased climbing orientation than nonmeditating colleagues. Two studies by R. Peters and associates (1977) showed that behavioural symptoms and measures of well-being improved greatly with the practice of meditational relaxation. Somatic symptoms and performance improved but to a lesser degree. An investigation by P. Carrington and others (1980), indicated that meditation and progressive muscle relaxation treatment groups reported significantly more symptom reduction than controls. This study also replicated another finding of Peter and others that less frequent practice may be as effective as frequent practice. Although the beneficial role of meditation is clearly indicated, more work needs to be done to reach an unequivocal conclusion that meditation practice reduces occupational stress.
A semi-automated training program in meditation was conducted by Collings and Gilbeard H. (1989) in the medical department at New York Telephone and the program was given to over 3,500 employees. The program was developed following a pilot study by P. Carrington and others (1980) that compared the effects of 3 leading meditation relaxation techniques on symptoms of stress in 154 employees over a 5½ month. Results show significant reductions in physiological complaints and other symptoms of stress with the use of meditation relaxation techniques.

In 1990, Dillbeck and Michael tested the hypothesis that consciousness has a fundamental field property that is relevant to social change in the direction of improved quality of life. The independent variable was the number of participants in the group practice of transcendental meditation (TM) and TM-sidhi program, a technology of consciousness predicted to reduce stress in society through a field of "pure consciousness". The period of the study was 1982-1985, but secondary analysis also included the period 1979-1985. The dependent variable was a violence index comprising of the number of weekly fatalities in the US due to 3 major causes of violent deaths, motor vehicle fatalities, suicide and homicide. Time series analysis using both the intervention analysis approach and the transfer function approach indicated a significant reduction in the violence index associated with the independent variables.

Relationship between experiences of Transcendental consciousness (TC) and Psychological Health (PH) was investigated by
Gelderloos and others (1990). In the first study, three groups of 15 subjects with different levels of experience in transcendental meditation (TM) and in TM-Sidhi program were studied (36 of these subjects participated in the posttest) using self investigation method of H.J. Hermans (1976). Experience with TM and TM sidhi program was positively related to a general measure of PH; longitudinally, the meditating groups improved more than the control group on the PH measure. In the second study, 2 contrast groups of 8 long-term participants were similar on several confounding variables but differed on physiological indicators of experiences of TC. The groups with the positive physiological indicators showed a trend toward higher scores on the PH factor, indicating that PH may be developed through the systematic cultivation of TM and TM-sidhi program.

To determine negative self-statements in response to high, medium, and low anger arousing situations, Dua and others (1992) conducted a study in which 29 highly angry university students went through a thought listening procedure. Subjects made more negative self-statements in response to a high anger-arousing situation compared with medium and low anger-arousing situations. Subjects were divided into 4 groups. Subjects in the negative thought-reduction, meditation, and placebo groups showed improvement in trait anger, anger aroused through high anger situations, anger scores across a variety of situations, unconstructive coping, and anger measured through physiological symptoms. Gains were maintained at 6 week follow-up. The no-
treatment group showed only a small but significant improvement in trait anger and in anger by high-anger situations.

Alexander and others (1989), conducted a study, in which 73 residents of 8 homes for the elderly (mean age 81 years) were randomly assigned among no treatment and 3 treatments highly similar in external structure and expectations: the Transcendental Meditation (TM) program, Mindfulness Training (MF) or a relaxation (low mindfulness) program. A planned comparison indicated that the "restful alert" TM group improved most, followed by MF, in contrast to relaxation and no treatment groups, on paired associate learning, certain measures of cognitive flexibility, mental health, systolic blood pressure, ratings of behavioural flexibility, and treatment efficacy. The MF group improved most, followed by TM, on perceived control. After three years, survival rate was 100% for TM and 87% for MF in contrast to lower rates for other groups.

Hormonal changes in 10 subjects who practiced autogenic training, 10 subjects who practiced transcendental meditation (TM), and 10 controls were observed by Gallious and others (1984). Findings reveal that cortisol plasma levels decreased (reaching a minimum of 2g/100 ml) prolactin plasma level of cortisol and prolactin were significantly lower in the TM group. Urinary catecholamines increased after 40 min of rest in the control group. It is suggested by the authors that these hormonal variations indicate a humoral modification opposite from the state induced by stress.
Mills and others (1990), examined whether behaviour techniques such as meditation and relaxation may be associated with reduced end organ adrenergic receptor sensivity in 10 adult males with 2-3 years of Transcendental Meditation (TM) practice and 10 matched controls. Reduced beta-adrenergic receptor sensitivity was found in TM subjects. TM subjects had a lower percentage of functional lymphocyte beta-adrenergic receptors but showed no difference in total receptor number or plasma catecholamines. There were no difference between the groups in Type A behaviour, the Type A components, exercise or family history of hypertension. Findings are discussed in terms of the efficacy of receptor measurement in psychophysiology research.

Serum cortisol and total protein levels, blood pressure (BP), heart rate, lung volume, and reaction time (RT) was studied by Sudsuang and others (1991), in fifty two 20-25 year old Thai males, practicing Dhamnakaya Budhist meditation and in 30 males of the same age group not practicing meditation. After meditation, serum cortisol levels were significantly reduced, serum total protein levels significantly increased; and systolic BP, diastolic BP, and pulse rate significantly decreased. Vital capacity, tidal volume, and maximum voluntary ventrilation were significantly lower after meditation than before. There were also significant decreases in RT during meditation practice. The percentage decrease in RT during meditation was 22% while in subjects untrained in meditation, the percentage decrease was only 7%.
Effect of Transcendental Meditation (TM) on the hypothalamo-hypophysial adrenal axis diurnal rhythms through the determination of hormone levels was evaluated by Infant and others (1996). Blood samples were taken at 0900 and 2000 hours from subjects aged (19-40 years) who regularly practised TM and from healthy non-meditators aged (26-35 years). Cortisol, b-endorphin, and adrenocorticotrophic hormone (ACTH) were measured at both hours. TM practitioners showed no diurnal rhythm for ACTH and for b-endorphin, in contrast to control subjects. Practitioners of TM with similar anxiety levels to those of the control group showed a different pattern in the daytime secretion of pituitary hormones. TM appears to have a significant effect on the neuroendocrine axis - because cortisol levels had a normal pattern in the TM group, these results may be due to a change in feedback sensitivity caused by this mental technique.

The effects of stress reduction with the Transcendental Meditation (TM) program on serum lipid peroxide levels were investigated by Schneider & others (1998) in forty one 56-74 years olds, 18 of whom were long-term TM practitioners mean age (16.5 years). Twenty three age-matched controls who were not practicing a formal stress-management technique also participated. Venous blood samples were analyzed for lipid peroxides by the thiobarbituric acid reactive substances (TBARS) array. A dietary questionnaire was used to assess fat intake, red meat consumption, antioxidants, vitamin supplementation, and smoking. Differences between groups and subgroups were analyzed by
t-test, and correlations. Significantly lower serum levels of lipid peroxide were found in TM practitioners as compared with controls. No significant differences were found between groups on smoking, fat intake, or vitamin supplementation. These preliminary findings suggest that lower serum lipid peroxide levels may be associated with stress reduction using the TM technique. Prospective controlled trials are needed to confirm that this effect is due to TM practice rather than to other lifestyle factors such as diet.

Physiological effects of three stress intervention strategies (management skills training, exercise and meditation) were examined by Bruning & others (1987), in a longitudinal field experiment. Sixty-two subjects were randomly assigned to four groups (three experimental groups and a control group). Pulse-rate, diastolic blood pressure, systolic blood pressure and galvanic skin responses were used as physiologic stress indicators. Analysis of covariance and comparison tests indicated that each of the strategies led to decreases in pulse rate and systolic blood pressure. Dual combination strategies also showed significant decreases in pulse rate.

According to Cunningham and others (2000), chest pain with normal coronary angiograms is often associated with chronic sympathetic activation, anxiety, and depression, and is resistant to conventional antianginal treatment. The practice of transcendental meditation, a standard relaxation method for 3 months twice daily, significantly improved exercise tolerance, angina episodes, and quality
A study was conducted by Zamarra and others (1996), in which twenty-one patients with documented coronary artery disease were tested at baseline by exercise tolerance testing, and assigned to either stress reduction using transcendental meditation (TM) program or to a wait-list control, after 8 months, the TM group had a 14.7% increase in exercise tolerance, an 11.7% increase in maximal workload, an 18% delay in onset of ST-segment depression, and significant reductions in rate-pressure product at 3 and 6 minutes, and at maximal exercise compared with the control group.

In another study, Muskatel and others (1984), placed 52 undergraduates who had volunteered to receive meditation training, into either high or low time urgency groups based on their scores on factor S of the Jenkins Activity Survey. Subjects then either received training in Clinically Standardized Meditation followed by 3½ wk. of practice or waited for training during that period. Analysis of scores on a time-estimation task and of self-reported hostility during an enforced waiting task indicated that meditation significantly altered subjects perceptions of the passage of time and reduced impatience and hostility resulting from enforced waiting.

Effects of stress reduction on both laboratory cardiovascular reactivity and ambulatory blood pressure in real life on 39 normotensive male subjects who were pretested for ambulatory blood pressure and
cardiovascular reactivity to stress using a battery of laboratory stressors, were evaluated by Wenneberg and others (1997). Subjects were randomly assigned to practice either the transcendental meditation (TM) technique or a cognitive-based stress eduction control (SEC) for four months. After 4 months, there was no change in cardiovascular response to stressors between the TM and control groups. However, the subjects regularly practicing TM demonstrated a significant reduction of 9 mm Hg (P<0.04) in average ambulatory DBP compared to controls. Since ambulatory BP monitoring has been shown to be a better predictor of cardiovascular complications of hypertension than clinic BP, this finding may have important implication for primary prevention of CVD in normotensive subjects.

Impact of Transcendental Meditation (TM) on cardiovascular reactivity was examined by Barnes & others (2001) in adolescents with high normal blood pressure both systolic blood pressure (SBP) and diastolic blood pressure (DBP). Subjects were randomly assigned to either (TM) (N=17) or health education control (CTL, N=18). The TM group engaged in 15 min meditation twice each day for 2 months including sessions during school lunch break. The TM group exhibited greater decreases in resting SBP from pre- to post intervention, compared to CTL group. The TM group exhibited greater decreases from pre- to post intervention in SBP, heart rate (HR) and cardiac output (CO) reactivity to the simulated car driving stressor and in SBP reactivity to the social stressor interview. The TM program appears to have a beneficial impact
upon CV functioning at rest and during acute laboratory stress in adolescent; at risk for hypertension.

Carlson and others (1988), tested the hypothesis that religious persons engaging in devotional meditation (DM) experienced physiological and psychological changes similar to those reported for persons using progressive relaxation (PR) exercises. 36 undergraduates divided into three groups (DM, PR, and a wait list control) underwent extensive psychophysiological assessment prior to and following a systematic introduction to either DM or PR. The hypothesis that DM could generate positive physiological and psychological effects similar to PR was partially confirmed.

In a study by English and others (1983), blood pressure (BP) and heart-rate were measured in 36 subjects (mean age 33 years) during periods of rest, intentional relaxation, unsignaled reaction time (RT), cold pressor tasks, and recovery periods, both before and after 4 weeks of progressive relaxation training, transcendental meditation analog treatment, an or assessment control condition. Both types of relaxation training resulted in significant reductions in BP, but not heart rate, levels across all posttreatment assessment intervals (baseline, stress periods, and stress recovery). Relaxation training did not reduce cardiovascular response during stress periods, but did result in more rapid BP reduction in stress recovery periods. Scores on the Jenkins activity survey were related to posttreatment BP than low scorers.
Delmonte, M.M. (1985) conducted a study in which 40 female non-meditators (mean age 23.1 years) were randomly assigned to 4 experimental cells devised to control for order and expectation effects. The subjects were continuously monitored on 7 physiological measures during both meditation and rest. Each subject was her own control in an ABAB experimental paradigm comparing meditation to rest. The subjects meditation for the first time showed marginally lower psychophysiological arousal during the meditation than rest condition for systolic blood pressure, heart rate, skin conductance level, and digital skin temperature. Deliberately fostering positive expectations of meditation was associated with lower physiological arousal in terms of diastolic and systolic blood pressure, heart rate, and skin conductance level.

Boswell and Murray (1979), found that meditation, relaxation, and anti-meditation procedures were equally effective in reducing anxiety, skin conductance, and heart rate in undergraudates.

Effects of "tanden breathing" by Zen practitioners on cardiac variability was examined by Lehrer and others (1999). Tanden breathing involves slow breathing into the lower abdomen. Eleven Zen practitioners, six Rinzai and five Soto, were each studied during 20 min of tandem breathing, preceded and followed by measurement of heart rate and respiration rate during 5 min of quiet sitting. For most subjects, respiration rates fell to within the frequency range of 0.05-0.15 Hz during Tanden breathing. Heart rate variability significantly increased within this low-frequency range but decreased in the high frequency range (0.14-0.4
Hz). Rinzai subjects breathed at a slower rate and showed an increase in very low-frequency waves, than observed among soto zen subjects. One Rinzai master breathed approximately once per minute and showed an increase in very low frequency waves. Total amplitude of heart rate oscillations also increased. More experienced Zen-practitioners had frequent heart rhythm irregularities during and after the nadir of heart rate oscillations. These data are consistent with the theory that increased oscillation amplitude during slow breathing is caused by respiration and that produced by physiological processes underlying slower rhythms.

Increased peripheral vasoconstriction (i.e., total peripheral resistance, or TPR) was implicated as playing an important role in the early development of essential hypertension by Barnes & others (1999). Some studies had demonstrated that transcendental meditation (TM) reduces high blood pressure, but the hemodynamic adjustments behind these blood pressure reductions have not been elucidated. Through then study Barnes & others (1999) tried to provide a preliminary investigation of the acute effects of TM or TPR. Subjects were 32 healthy adults (16 women and 16 men; mean age 46 years). Subjects were divided into a TM group of long-term TM practitioners and a control group. Homodynamic functioning was assessed immediately before and during 3 conditions: 20 min of rest, with eyes open. 20 min of TM (TM group), and 20 min of eyes-open rest. The TM group had decreased in systolic blood pressure (SBP) and TPR, compared with increases in the control group. During TM, there was a greater decrease in SBP due to a concomitantly greater
decrease in TPR compared with the control group during eyes closed relaxation.

The study of Brownstein and Dembert (1989) showed that the practice of yoga meditation increased self-confidence and health, and reduced pain, anxiety and mild essential hypertension.

The effectiveness of progressive muscle relaxation and meditation in producing mental calmness and muscular relaxation (MR), and in reducing blood pressure and pulse rate in university students was compared by Dua (1992). Subjects were trained to either relax, meditate, or sit quietly (Placebo training). Dependent variables were assessed during four sessions of baseline, eight sessions of training, and two follow-up sessions. During baseline and follow-up, subjects sat in the experimental room for 20 minutes. During training subjects listened to the appropriate audio cassette on which either relaxation, meditation (M), or placebo instructions were recorded. Dependent variables were assessed at the beginning and end of each session during baseline, training and follow-up. Results showed that during baseline, there was no change in muscular relaxation from beginning to end in the three groups, however, the relaxation and meditation groups showed an increase in mental calmness from beginning to end. Training significantly increased mental and MR in the relaxation and M groups. These gains were maintained at follow-up placebo group showed significant increase in muscular relaxation only during training, however these gains were not maintained at follow-up. Nearly all the subjects had blood pressure in the normal range.
Dixit and Others (1994) evaluated 48 adults with mild moderate essential hypertension for electrophysiological changes following biofeedback technique: 28 cases were trained in vipasana meditation. Electrophysiological parameters showed a significant effect of the meditation in regulating blood pressure.

A number of studies by Patel (1973, 1975); Patel and North, (1975), showed that meditation reduced blood pressure and medication intake.

Delmonte and Kenny (1987), found that meditation reduced drug abuse and anxiety, and was useful for mild neurosis, headache and hypertension.

The usefulness of the relaxation response in the treatment of hypertension has been substantiated by Stone and Deleo (1976). In their subjects, urinary sodium excretion exceeded 124 mg per litre throughout the experiment. Mean arterial blood pressure did not change in the control group, but in the group who elicited the relaxation response for six months by means of a Buddhist meditation exercise, systolic blood pressure with the subject upright was decreased by 15 mm of mercury, and diastolic pressure by 10 mm (P < 0.05). These patients also exhibited significant decreases in plasma activity of dopamine-beta-hydroxylase (P < 0.05) in both the supine and upright positions, and reduction in furosemide-stimulated renin activity in the upright position.

Seven selected hypertensive patients were stabilized on drugs by Blackwell and others (1976), at a research clinic. Subjects learned
transcendental meditation (TM). They were seen weekly, and took their own blood pressure several times daily. After 12 weeks of TM, six subjects showed psychological changes and reduced anxiety scores. Six subjects also showed significant reductions in home and four in clinic blood pressures. Six months later four subjects continued to derive psychological benefit and two showed significant blood pressure reductions attributable to TM at home and clinic.

The findings of most of the previous studies show that meditation brings about some decrease in the systolic as well as diastolic blood pressure. It is a matter worth contemplating that if strategy used for meditation is made to includes focussing on a concept revered by the meditator, it is possible that gains would be even greater. This aspect needs to be taken into consideration. It is observed that although meditation has been studied vis-a-vis lowering of blood pressure, little work has been done on evaluating sense of well-being of the hypertensive and angina patients. Sense of well-being is an important index of health, therefore, it needs to be studied if meditation can bring improvement in it. An important aspect of well being is that may emanate from relief from immediate symptoms and well being that is related to a broader life perspective ability to derive pleasure from interactions and life activities. The latter reflect a positive health viewpoint rather than status of mere absence of disease. Further although efficacy of meditation on hypertension has been studied, little work has been done on impact of meditation in response to angina pectoris. This area needs to be probed.
Gender is another factor that needs to be investigated since meditation is a phenomenon which may be influenced by it.

Type A personality has been associated with CHD for the last many years, but this concept has never been studied with reference to meditation. It would be enlightening to study whether type A and type B patients differ in response to meditation. The fact that type A is associated with behaviours which are likely to be controlled by meditation makes one surmise that meditation may benefit the type A patient more. The query is however open to investigation.

On the basis of extensive literature search and researcher's own understanding of the phenomena under study, the researcher has formulated the following broad research questions.

1. Do hypertension, angina and combined disease patients undergoing meditation (Md) show greater improvement in terms of systolic blood pressure (SBP), diastolic blood pressure (DBP) and sense of well-being (SWB) than those not undergoing Md.

2. Do hypertension, angina and combined disease patients undergoing Md differ from those not undergoing Md on their 24 week SBP, DBP and SWB profile.

3. Do hypertension, angina and combined disease patients falling in type A category differ from those falling in type B category in their response to drug therapy (DT) in terms of SBP, DBP and SWB.
4. Do hypertension, angina and combined disease patients falling in type A category differ from those falling in type B category in their response to Md in terms of SBP, DBP and SWB.

5. Do type A hypertension, angina and combined disease patients undergoing Md show greater improvement in terms of SBP, DBP and SWB than those not undergoing Md.

6. Do type B hypertension, angina and combined disease patients undergoing Md show greater improvement in terms of SBP, DBP and SWB than those not undergoing Md.

7. Do female and male hypertension, angina and combined disease patients differ in their response to DT in terms of SBP, DBP and SWB.

8. Do female and male hypertension, angina, and combined disease patients differ in their response to Md in terms of SBP, DBP and SWB.

9. Do female hypertension, angina and combined disease patients undergoing Md show greater improvement in terms of SBP, DBP and SWB than those not undergoing Md.

10. Do male hypertension, angina and combined disease patients undergoing Md show greater improvement in terms of SBP, DBP and SWB than those not undergoing Md.

11. Do hypertension patients undergoing Md differ on symptom-related SWB from those not undergoing Md.
12. Do hypertension patients undergoing Md differ on non-symptom related SWB from those not undergoing Md.

13. Do angina patients undergoing Md differ on symptom-related SWB from those not undergoing Md.

14. Do angina patients undergoing Md differ on non-symptom-related SWB from those not undergoing Md.

15. Do combined disease patients undergoing Md differ on symptom related SWB than those not undergoing meditation.

16. Do combined disease patients undergoing Md differ in response to non-symptom-related SWB than those not undergoing Md.

By probing into the above stated research questions, the phenomena under study will be clarified and explained to some degree.