Chapter - II

REVIEW OF RELATED LITERATURE

Thorenz\(^1\) conducted a study to test the hypothesis that abbreviated relaxation training and practice leads to chronic physiological changes. These changes included decreased resting muscle potentials (MAPs), decreased resting oxygen consumption, increased forearm blood flow, decreased resting heart rate and decreased resting arterial blood pressure. In this investigation 103 volunteers subjects were screened for EMG activity and 40 subjects with the highest EMG scores, were chosen and divided into two groups experimental and control.

The experimental group underwent 6 weeks of abbreviated relaxation training and practice (2 times/week, 30 minutes per session) using the method of Jacobson as modified by Wolpe and Lazarus, while the control continued with their normal schedule. The findings suggested that under the experimental conditions of

this investigation, abbreviated relaxation training and practice over a period of 6 weeks is not effective in bringing about chronic physiological changes characteristics of the relaxation response.

Thomas² made a study to investigate the effects of three contemporary anxiety reduction techniques upon anxiety and performance in a class situation. Subjects were volunteers of students from exercise and health classes. Subjects practised three hours of either progressive relaxation, heart rate feedback, content specific meditation or simply sat and rested for three hours throughout the 10 weeks period of class involvement.

In the end of the class it was concluded that there was no significant difference between groups on the performance variable the despite the drop in anxiety.

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Loutfy³ conducted a study to evaluate the effectiveness of relaxation self control (RSC) and vasomotor behavior rehearsal (VMBR) techniques of wrestlers tournament performance. On the basis of statistical findings and limitation of study it was found that:

1. Relaxation Self Control Technique controlled the facilitating response in trait anxiety and the cognitive component serve in Stae Anxiety but it seemed no more effective than 'no treatment' in regard to the debilitating effect in trait anxiety and the autonomic arousal component of state anxiety.

2. Relaxation Self Controlled developed positive perception of the ability of they achieved a significant improvement in wrestling performance.

Zardus made an attempt to determine the effect of relaxation training programme on the development of badminton skills in college women. Twenty two freshman and college women were taken as subjects for experimental group were given instructional programme in Badminton using Jacobson Method. The control group consist of twenty one women. The result indicated significant effect of relaxation training programme on badminton skills in college women.

Karen investigation examined the effect of specific training techniques involving progressive muscle relaxation, imagery practice and physical practice had on the performance of a moderately difficult motor skill. Four treatment groups were formed:

1. Relaxation, Imagery and Physical Practice
2. Imagery and Physical Practice
3. Relaxation and Physical Exercise
4. Physical Practice


Result of study indicated that the relaxation and imagery technique is no more effective than the other three training techniques in improving performance on a moderately difficult motor skill by averaged skilled performances.

Thomas⁶ conducted a study to evaluate the effectiveness of six week of endurance training progressive relaxation, meditation on the physiological response to stress. Thirty seven health female subjects were randomly assigned to one of four treatment groups:

1. Control : no specific training
2. Exercise : 20 minutes/day, 3 days/week
3. Meditation : 20 minutes/day, 3 days/week
4. Combination : exercise plus meditation

From the results it would appear that the two groups trained in progressive relaxation meditation showed a greater effect on heart rates and blood pressure than the exercise group.

Wanger and Bagchi\textsuperscript{7} measured finger temperature and finger pulse volume before and after Kapal Bhati, Ujjayi and Bhasrika Pranayama and reported that:

1. Average finger temperature decreases in Ujjayi and Bhasrika only.

2. It showed increase in Kapal Bhati.

3. The heart rate showed elevation of two beats per minute during Bhasrika, 4 beats during Kapal Bhati.

4. In non-yogic hyperventilation the elevation was much greater, amounting to increase of 28-32 beats per minutes.

5. In the same subjects, systolic blood pressure increase by 6mm. of Hg. during Bhasrika and 12mm. of Hg. during Kapal Bhati and decreases slightly during Ujjayi.

Johnson and Buskirk\textsuperscript{8} mentioned about the changes in the respiratory responses to energise during training. The changes were progressive and four to six weeks were regarded as adequate to reach maximum efficiency.

Changes in pulmonary ventilation per minute and associated with a degree in rate and an increase in depth of breathing (increased vial capacity). In the trained subjects even at rest the depth of breathing was found to be greater.

Wenger, Bagchi and Anand\textsuperscript{9} investigated on four yoga practitioners in relation to pulse rate and heart. Two practitioners claimed to stop the heart. One formerly made this claim but also demonstrated his method, the fourth claimed only to slow the heart rate. The method for the first three was similar, as it involved relation of breath and considerable muscular tension in the abdomen and thorax with closed glottis. It was concluded that venous return to the heart was retarded but that the heart was not stopped, although heart and radial pulse rate weakened or disapproved the fourth subject, with different interviewing


mechanism also presumably under straited muscle controlling did markedly slow his heart rate. The results indicated a strong increase in vegal tone of unknown origin.

Bhole and Karambelkar\(^\text{10}\) studied the "effect of yoga training on vital capacity and breath holding time," measuring vital capacity in ml. and breath holding time in seconds respectively in 147 and 139 males respectively between the age group of 18-50 years, before and after 3 weeks training programme in 20 asana, two breathing practice of 3 kriyas at nine yoga camp held during the year 1959-69. An average increase of 15 seconds in the breath holding time and 157 ml. in vital capacity were observed after training period.

Another study was conducted on breath holding (internal and external) and vital capacity, the results indicated a consistent improvement both in breath holding and vital capacity as a result of yogic training.

A study on physical fitness as influenced by yogic training indicated that school children and adults undergoing long and short-term yoga training showed improvement in physical fitness index.

According to M.M. Gore\textsuperscript{11} some physiological effects of Kapal Bhati are:

a) The respiratory rate becomes shallow in nature.

b) The tidal volume decreases.

In normal breathing it is 450 to 500 ml. per breath while in Kapal Bhati the tidal volume has been found to be only 150 to 200 ml. per breathing cycle. Minute ventilation (MV), however, increases about three times more than that in the normal breathing due to increased breathing rate.

In normal breathing M.V. (Minute Ventilation) is 7.5 ml/min. while on Kapal Bhati M.V. and about 20.5 litre/min. Oxygen consumption increase due to increased work of breathing. Consequently carbon-di-oxide oxygen consumption

\textsuperscript{11} M.M. Gore, "Book on Anatomy and Physiology of Yogic Practices" pp. 143-144.
increased by to 14% over a normal breathing an then decreases by 3%, after the practice is over compared to normal values. As large quantity of Co₂ is removed out during Kapal Bhati.

The heart rate (HR) increases slightly by 15 to 20 beats/min. and systolic blood pressure also increased by 7 to 10 mm. of Hg. The diastolic blood pressure remains more or less the same. Although diastolic blood pressure remains more or less same.

The Kapal Bhati not only cleans the respiratory passages and keeps it free from impurities and but also stimulates the nerves in the abdominal (Navel) region and in the skull. It produces a peculiar awareness in the forehead region and intences the Bhumadhya dristi. It also helps in awakening of Kundalini Power. It gives excellent message to the abdominal organs and improves digestion. It reduces the dentness for external environment and induces inner awareness.

Kapal Bhati is one of the cleansing process it has been studied scientifically by some investigators that it improves fitness of an individual.
Ganguly and Gharote\textsuperscript{12} with the view to see the immediate effect of Kapal Bhati on cardio-respiratory endurance as measured through Harward Step Test. Significant improvement ($P < 0.01$) was seen in the cardiovascular endurance after performing one minute of Kapal Bhati, on compared to Hyper-ventilation. In a research done in Kaivelyadhama it was seen that 1 min. of Kapal Bhati as well as hyperventilation help to improve cardio-vascular efficiency.

Bhole and Kambekkar\textsuperscript{13} studied the effect of yoga training on vital capacity and breath holding time, measuring vital capacity in ml. and breath holding time in seconds respectively in 147 and 139 males respectively between age group of 18-50 years, before and after three weeks training programme in twenty asanas, two breathing holding practices and three kriyas, at nine yoga camps held in the year 1959-69. An average increase of 15 sec. in the breath holding time and 157 ml. in vital capacity were observed after the training period which was found statistically significant.


Moses\textsuperscript{14} conducted a study to investigate the effect of yoga on flexibility, vital capacity and breath holding time, and found significant improvement in all these factors.

William, John and James\textsuperscript{15} designed research to assess performance changes attributed to Transcendental Meditation has shown clear segregation of reaction time distribution between practitioners of Transcendental Meditation and subjects in either a rest or mental task control group. 42 subjects served in one of three conditions:

14 Actual Transcendental Meditators
14 Pseudo Meditators
14 Rest Control

All received same pre and post-visual choice reaction time task, a 40 trial Red/Green discrimination during 20 min. "rest period", Transcendental Meditators meditated, Pseudo- Meditators were instructed to focus on some word and others

\textsuperscript{14} Robson Moses, "Effect of Yoga and Flexibility and Respiratory Measures of Vital Capacity and Breath Holding Time" \textit{Ed Dissertation} (University of Oregon, 1972) : 76-77.

rested quietly. Inspection of significant interaction (F = 5.78, df = 2/42, p < .05) showed the facilitated performance of the transcendental meditation after meditation compared to the pseudo mediators and control group.

Johnson and Farrow\textsuperscript{16} reported the effect of Transcendental Meditation and Transcendental Meditation Sidhi program on reaction time. Three groups of 19 subjects were selected for study - one group who had been practicing the Transcendental Meditation and Transcendental Meditation Sidhi program for between one and two years, second group with no previous experience of Transcendental Meditation or any other relaxation technique but who were interested in learning Transcendental Meditation and a third group with no experience of meditation or relaxation procedures who were administered on a 100 trial reaction time test. One way analysis of variance showed a significant treatment effect on reaction time (p < .001) for each individual block of ten trials, the subjects practicing the Transcendental Meditation and Transcendental Meditation Sidhi program revealed a significantly faster reaction time than either of the two controlled groups. (p value ranged from 0.1 to .01).

Williams\textsuperscript{17} designed study to examine the relation between Transcendental Meditation and the acquisition of fine perceptual motor skills by using the mirror tracing task. Two groups of subjects were tested. The Transcendental Meditators consisted of 19 males and 13 females volunteers who had been meditating an average of 30.66 months, while the groups of non-meditators (which also include 19 males and 13 females) had no experience of meditation. The apparatus was the mirror star tracer. Both groups of subjects performed 10 trials on the first day the further 10 trials approximately 24 hours later.

Analysis of variance of groups x trials were carried out for each program performance measures over the 20 trials and main effect of between two groups were not significant. (F, .62 = 0.48 and 0.38, p>.05) for time and error respectively. Similarly the interaction of groups and trials did not reach significance. For this F\textsubscript{19}, 1178 = 0.44 and for errors F\textsubscript{19}, 1178 = 1.11 (p>.05).

Stuart and Lawrence\textsuperscript{18} studied simple reaction time to light onset. 30 volunteers from College populations were selected for the study. The mediators were 15 volunteers who had been trained in Transcendental Meditation. 15 other students not experienced Transcendental Meditation kept in control group. A stimulus lamp was used to measure simple reaction time before and after 20 Min. of differing mental activity. Mean reaction time were significantly difference from the following rest condition and sorting tasks but mediators showed no differences in reaction time after meditation. However, their scores were significantly faster 247 m. sec. for mediators in comparison to 249 (Non Mediators).

Johnson and Farrow\textsuperscript{19} reported the effect of Transcendental Meditation program on athletic performance. Athletes desiring to learn Transcendental Meditation were randomly selected and assigned to experimental group and a control group of 15 students each. Athletic performance test were administered to both groups before the experimental group the instruction in Transcendental


Meditation and again six weeks after the experimental group was taught Transcendental Meditation.

The meditating athletes improved significantly more than the non-mediator group in the 50 m. Dash (p<.001), the agility test (p= .0023), the standing broad jump (p= .0056) and a reaction time and coordination test (p<.001). The mediators also improved in the shot put and a strength test but not significantly more.

The physiological improvement of the experimental group was superior to that the control group of all measures: Cardio-vascular Efficiency step test - (p.001) Respiratory Efficiency Vital Capacity - (p<.001).

Johnson and Farrow\textsuperscript{20} reported a study to measure the long term and short term effects of the Transcendental Meditation technique on sensory motor performance.

The subjects were 36 college age males, 21 Experimental subjects who had been practicing the Transcendental Meditation technique about 5 months and 15

\textsuperscript{20} Ibid, pp. 326-330.
control subjects. All subjects were tested on a sensory motor task (Labyrinth game) with ten trials in each test. Twelve of the 21 meditators meditated for 20 min. between the two tests. The remaining nine and all the control subjects rested for 20 min. between test.

The mean performance of all the meditators on the first test was significantly better than that of the control subjects ($p = .041$). All groups improved after the interval of rest meditation, but the group that meditated displayed a greater improvement than the resting mediator ($p = 0.018$) and resting control ($p < 0.001$). The difference between the resting meditators and resting control was not significant. These results indicate the Transcendental Meditation produces both short term and long term improvement of sensory motor performance.

Johnson and Farrow\textsuperscript{21} reported the effects of the Transcendental Meditation program on Trait Anxiety. 37 high school and College students who had been practicing Transcendental Meditation from six months to six years volunteered themselves from a group of people attending an advance lecture on

\textsuperscript{21} Ibid., pp. 468-469.
Transcendental Meditation. The Trait Anxiety scale of State Trait Anxiety Inventory developed by Spielberger, Garsuch and Lushane was used to measure the level of anxiety. Three days later a second group of 15 students attending introductory lecture on Transcendental Meditation program, but who had not yet learned to practice the technique, volunteered to complete the Trait Anxiety scale after the lecture.

A 't' - test showed that the mediators were found to be less anxious than the non-mediators (p<.001).

Johnson and Farrow\textsuperscript{22} reported the influence of the Transcendental Meditation program on State Anxiety, State-Trait Anxiety Inventory A-State scale was used as a measure of anxiety. The anxiety scale was initially administered to eight experimental subjects and nine control subjects two days before the experimental subjects began the Transcendental Meditation technique. Six weeks later subjects were requested to carry out a demanding task; immediately there after the control group was instructed to sit with closed eyes and the experimental group to mediate for 15 minutes. The anxiety scale was than readministered.

\textsuperscript{22} Ibid., pp. 434-436.
Result shows that there was no significant difference in the mean scores for experimental and control groups on the first administration of scale. The reduction in anxiety between the two tests was significantly greater for the mediators than for the non mediators (p<.05, ‘t’ test).

Johnson and Farrow\textsuperscript{23} reported the influence of the Transcendental Meditation technique on simple reaction time and to compare the relative influence of Transcendental Meditation and ordinary rest.

Two groups of 25 College age subjects were individually tested four times on four days with in a two week period. Group-I (Mediators) were tested with 100 trials both before and after a 20 minutes session on Transcendental Meditation (Day 1 and 3) and also before and after 20 minutes of supine rest with closed eyes on (Day 2 and 4). Group-II (Non-Mediators) were tested before and after 20 minutes period of sitting rest with eyes closed and before and after an equal period of supine rest with eyes closed on (2 & 4) day. Additionally 53 teachers of

\textsuperscript{23} Ibid., pp. 316-321.
Transcendental Meditation technique (Group-III) were simply measured before and after one meditation.

Results show an improvement in reaction time performance after meditation in group-I and III (p<.001) and a lowered performance after supine rest (p<.001) in the group-I Mediators.

Now mediators showed no significant change in reaction time after either condition of ordinary rest.

A comparison of pretest mean reaction time for group-I and group-II indicated that mediators as a group have faster reaction than non mediators (p<.01).

Johnson and Farrow\textsuperscript{24}, reported a research on the effect of the Transcendental Meditation program on Anxiety, Neuroticism and Psychoticism. Seventeen students who practiced the Transcendental Meditation technique regularly and 13 who had learned Transcendental Meditation but did not practice it

\textsuperscript{24} Ibid, pp. 594-596.
regularly were given IPAT Anxiety scale and Psychotiscism, Neuroticism. Extroversion and Lie scales of the PENL before and after 3-4 months after starting the Transcendental Meditation program.

In analysis of co-variance indicated that decline in psychoticism in mediators being significantly different from the change among irregular mediators (p=.05).

A paried ‘t’ - test showed significant decline in anxiety of mediators regularly doing (p<.01) and the irregular (p<.05).

Johnson and Farrow\textsuperscript{25} reported a study on effect of Transcendental Meditation technique up on a complex Perceptual Motor task.

College age subjects were selected for study 8 practicing Transcendental Meditation consisted group-I and 10 students who had not received instruction in Transcendental Meditation consisted control group-II. Both the groups were

\textsuperscript{25} Ibid, pp. 322-325.
tested on a Mirror star tracing. Group-I meditated for 20 min. while the other group-II relaxed with closed eyes.

Individual practicing the Transcendental Meditation technique performed significantly better after meditation than non mediators did after rest on complex perceptual Motor Task. The Mediators completed task in a mean of 67.05 sec. with a mean of 21.13 errors. The corresponding means of the non mediators (N=10) were 104.3 sec. and 39.28 error. The mediators were significantly after (p=0.36) and significantly made fewer errors (p=.34) than non-mediators.

Matveyev\textsuperscript{26} states that the stance ability, according to a well known physiological data is ensured by the stancetonic reflexes and arbitrary regulation of the stance on the basis of the acquired form of the coordination of movements with a complex participation of analyzers (visual, motor, vestibule etc). This is the general mechanism of maintaining balance both in static as well as in dynamic exercises. Its specific in sports exercise are conditioned by the specific of the interactions of the internal and external forces in maintaining the stance inherent in

\textsuperscript{26} Matveyev, \textit{Fundamentals of Sports Training}, p. 157.
sports by the peculiarities of the sensory corrections and the forms of coordination movement.

Debra27 studied the effect of Transcendental Meditation on normal and Jandrassik reflex time to assess any change in nervous system functioning following instructions in Transcendental Meditation. 14 Male students with a mean age of 21 years and mean height of 70” served as volunteer subject in this study. All the subjects were non mediators at the onset of the study.

Reflexes were assessed initially in motor control laboratory. One week following the initial reflex baseline measures each subject began a once per week. These weekly observations continue for 5 weeks.

A repeated measures of analysis of variance for baseline session 1 and 2 should no significant difference over days for normal or Jandrassic reflex tuning or their components. There was a mean reduction of 14.41 m.sec. in normal total reflex time 3.19 m.sec. in its latency and 10.95 m.sec. in motor time.

Paul and Michael\textsuperscript{28} examined the E.E.G. response to Intermittent photic stimulation in a group of subjects experienced in meditation and compared with those of a control group.

The mediators exhibited significantly smaller decrement in alpha activity and alpha blocking over the course of experiment then did the control group and alpha induction occurred earlier and more frequently in the meditation.

Banquet\textsuperscript{29} examined the classical E.E.G. combined with spectral analysis, performed on a group of subjects during Transcendental Meditation. The findings were compared to those obtained in a resting control group.

Alpha rhythm increased in amplitude but slowed down in frequency and extended to anterior channels at the beginning of meditation.


In a second stage theta frequencies different from those of sleep diffused from frontal to posterior channels.

This supported that E.E.G. records from mediators practicing Transcendental Meditation distinguish the meditative state from other state of consciousness.

Bernhard\textsuperscript{30} conducted a double blind study to see the effect of Transcendental Meditation on concentration ability. 60 Practitioners of Transcendental Meditation were randomly assigned to two treatment group. One group meditated for 20 minutes while the other read a test quietly. The test $d_2$ (Brichkkenkamp 1962) was used and both the groups were tested before and after the treatment to measure their concentration ability.

There was no difference between groups ($F<1.00$), although there was a significant improvement from pretest to posttest in both groups ($F = 46.28$, $df = \ldots$)

\textsuperscript{30} Bernhard A Sabel, "Transcendental Meditation and Concentration Ability, Perceptual and Motor Skills 50 (June 1980) : pp. 799-802.
1/56, p<0.001), so mediators had no measurable short term effect on concentration and the subject’s experience of meditation was not correlated.

Sharma\(^{31}\) conducted a study on selected physiological variables on inter college level Judokas with a purpose to find out the effect of Bhastrika Pranayama on Cardio-Respiratory Endurance. The variables selected for the study were vital capacity, peak flow rate, maximum breath holding time (positive and negative) and Resting pulse rate. In order to study the effect of Bhastrika Pranayama on cardio-respiratory endurance ‘t’ test was used. On the basis of results, following conclusions were drawn:-

1. Bhastrika pranayama practice have significantly contributed to cardio-respiratory functions, mainly pulse rate, vital capacity, breath holding time, peak flow rate and cardio-vascular efficiency.

2. On the basis of the study it may also be considered that Bhastrika pranayama could be used for training Judokas for improving cardio-respiratory efficiency.