Chapter 2

LITERATURE REVIEW

The scientific literature involving the treatment variable meditation and the dependent variables anxiety and cognitive performance is enormous. However, most of these studies have reported the relationship involving the treatment of meditation, with either anxiety or cognitive performance. Very few scientific studies involving meditation have dealt with these two dependent variables simultaneously. Moreover, the variable ‘cognitive performance’ has a much wider scope than anxiety. Cognitive performance includes wide variety of mental test and functions. This provides a great scope for wider and deeper probe into the effect of meditation on both the dependent variables.

The literature survey on the area of meditation, anxiety and cognitive performance was conducted using the conventional library search as well as the latest electronic search method.

Most of the scientific investigations into the psychological and personality effects of meditation were initiated in the 1970s with the popularity and mass embrace of the TM in the late 1960s in US.

MEDITATION AND ANXIETY

Nidich, Seeman, and Dreskin (1973) administered the State-Trait Anxiety Inventory on eight experimental subjects and nine control subjects two days before the experimental subjects began the practice of TM. Six weeks later the subjects were asked to carry out a demanding task, after which the control group was instructed to sit with eyes closed and the experimental group was instructed to meditate for fifteen minutes. The anxiety scale was then re-administered. Mean anxiety scores for the two groups were not significantly different on the first administration of the test. The
reduction in anxiety between the two tests was significantly greater for the meditators than for the non meditators. Since both groups were exposed to knowledge about the TM program but only the experimental group was instructed in the technique, it appeared that the reduced anxiety in the meditators was due to the experience of TM rather than knowledge about it.

Puryear, Cayce, and Thurston (1976) randomly assigned one hundred fifty-nine Association of Research and Enlightenment members either to a treatment or control group, with the former learning a new meditation technique (Edgar Cayce's approach) and the latter continuing their customary daily pattern. Analysis of variance was used to compare group means of the scale scores yielded by the IPAT Anxiety Scale and the Mooney Problem Check List (MPCL). Unlike the control group, the treatment group reported highly significant reductions on the IPAT Anxiety Scale scores after twenty-eight days of meditation with the new approach. No significant differences were found on MPCL for either the treatment or control group.

Goleman and Schwartz (1976) compared meditation and relaxation for their ability to reduce stress reactions in a laboratory threat situation. Thirty experienced meditators and thirty controls meditated or relaxed, with eyes closed or with eyes open, then watched a stressor film. Stress response was assessed by phasic skin conductance, heart rate, self-report, and personality scales. Meditators habituated heart rate and phasic skin-conductance responses more quickly to the stressor impacts and experienced less subjective anxiety (as indicated by the Activity Preference Questionnaire, State-Trait Anxiety Inventory, and Eysenck Personality Inventory).

Davies (1977) administered Spielberger's State-Trait Anxiety Inventory and Shostrom's Personal Orientation Inventory on three groups of undergraduates. A group of twenty-five was taught TM, a group of forty was taught progressive
relaxation, and a group of twenty-seven acted as controls. Seven weeks later, both inventories were re-administered to all groups. Only the subjects who regularly practiced TM showed a significant reduction in trait-anxiety scores compared with controls.

Stern (1977) administered the Trait Anxiety Scale of Spielberger's State-Trait Anxiety Inventory to an experimental group of thirty-seven subjects practicing the TM technique and to a control group of fifteen subjects not practicing TM. The meditators were found to be significantly less anxious than the non meditators.

Lazar, Farwell, and Farrow (1977) reported that eleven subjects showed a significant decrease in mean anxiety scores on Campbell and Stanley's Recurrent Institutional Cycle Design and the IPAT Anxiety Scale Questionnaire four weeks after learning the TM technique. Similar results were obtained in a second experiment.

Benson, Dryer, and Hartley (1978) explored the efficacy of two non pharmacological techniques for therapy of anxiety: a simple meditation relaxation technique and a self-hypnosis technique. Thirty-two patients were divided into two groups and instructed to practice the assigned technique daily for eight weeks. Change in anxiety was determined by psychiatric assessment, physiological testing, and self-assessment. There was essentially no difference between the two techniques in therapeutic efficacy according to these evaluations. Psychiatric assessment revealed overall improvement in 34% of the patients, while self-rating assessment indicated improvement in 63% of them.

Kirsch and Henry (1979) examined the effect of self-desensitization and meditation in the reduction of public speaking anxiety. Thirty-eight speech-anxious students were assigned to a control group or one of the following self-administered
treatment conditions: systematic desensitization, desensitization with meditation replacing progressive relaxation, or meditation only. The results indicated that the three treatments were equally effective in reducing anxiety, and all of them produced a greater reduction in self-reported (but not behavioral) anxiety than that found in untreated subjects. Reliable changes in physiological manifestations of anxiety were found only in those subjects who rated the treatment rationale as highly credible. High credibility ratings were also associated with significantly greater reductions in self-reported anxiety.

Lehrer, Schoicket, Carrington, and Woolfolk (1980) assigned thirty-six volunteer participants to a progressive relaxation group, a clinically standardized meditation group, or a waiting-list control group asked to relax daily without specific instructions. Subjects were given the state and trait scales of the State-Trait Anxiety Inventory and the IPAT Anxiety Inventory two times, separated by five weeks, during which the two treatment groups received four weekly sessions of group training. At the end of the five-week period all subjects were tested in a psychophysiology laboratory where they were exposed to five very loud tones. Using the techniques they had learned while anticipating the loud tones in the psychophysiology laboratory, the meditation group exhibited higher heart rates and higher integrated frontalis EMG activity. However, they also showed greater cardiac decelerations following each tone, more frontal alpha, and fewer symptoms of cognitive anxiety than the other two groups, according to the two inventories.

Raskin, Bali, and Harman (1980) studied thirty-one chronically anxious subjects to compare their responses to muscle biofeedback, TM, and relaxation therapy. The study consisted of a six-week baseline period, six weeks of treatment, a six-week post treatment observation period and later follow-up. Each subject was
ranked according to the degree of improvement on five anxiety variables: Taylor Manifest Anxiety Scale Score, Mean Current Mood Checklist score, situational anxiety, symptomatic distress, and sleep disturbance. The results indicated that neither EMG feedback nor TM was more effective in alleviating the symptoms of chronically anxious patients than relaxation therapy. Additionally, the three treatments were similar with respect to both the time course for obtaining therapeutic results and the subjects' ability to maintain these results once they were obtained.

Fling, Thomas, and Gallaher (1981) randomly assigned sixty-one undergraduate volunteers to clinically standardized meditation, quiet sitting or waiting-list groups. Nineteen others were assigned either to a group practicing "open focus," a technique that begins with awareness exercises focusing on bodily spaces and continue to an expanded awareness of space permeating everything or to a waiting list. All subjects were tested before training and again eight weeks later. All groups except the waiting list decreased significantly on Spielberger's Trait Anxiety.

Throll (1981) administered the Eysenck Personality Inventory, the State-Trait Anxiety Inventory and two questionnaires on health and drug usage to thirty-nine subjects before they learned TM or progressive relaxation. All subjects were tested immediately after they had learned either technique and then retested five, ten, and fifteen weeks later. There were no significant differences between groups for any of the psychological variables at pretest. However, at posttest the TM group displayed more significant and comprehensive results (decreases in Neuroticism/Stability, Extraversion /Introversion and drug use) than did the progressive relaxation group. Both groups demonstrated significant decreases in State and Trait Anxiety. The more pronounced results for meditators were explained primarily in terms of the greater
amount of time that they spent on their technique, plus the differences between the
two techniques themselves.

DeBerry (1982) enlisted the participation of thirty-six female volunteers ranging in age from sixty-three to seventy-nine years in a twenty-week study designed to evaluate the effects of meditation/relaxation on symptoms of anxiety and depression. Amongst the participants, 83% were widows who were selected because of complaints of anxiety, nervousness, tension, fatigue, insomnia, sadness and somatic complaints. Participants were randomly assigned to one of three groups: (I) relaxation/meditation, (II) relaxation/meditation with a ten-week follow-up consisting of practice on a daily basis using relaxation/meditation tapes, and (III) a pseudo relaxation control group (N =12 per group). The treatment groups received one week of baseline evaluation, ten weeks of weekly thirty-minute training sessions, and a ten-week follow-up, with taped relaxation sessions for group II. The control group followed an identical schedule for ten weeks but did not participate in the follow-up. The Spielberger Self-Evaluation Questionnaire and the Zung Self-Rating Depression Scale were administered before treatment, at the end of the ten weeks of training and again at the end of the follow-up period (for the treatment groups). In comparison to the control group, the treatment groups manifested a significant pre- to post treatment decrement for both state and trait anxiety. When the treatment groups were compared as to the efficacy of the follow-up practice sessions, it was found that the practice group continued to show a decrement in state anxiety while the no practice group exhibited a return toward baseline levels. However, trait anxiety continued to decrease for both groups. In terms of depression, there was a tendency toward a decrease in mean symptom scores that failed to reach significance. Yet, when questions that
correlated highly with anxiety and somatic symptoms were removed and analyzed separately, a significant pre- to post treatment decrement was noted.

Woolfolk, Lehrer, McCann, and Rooney (1982) recruited thirty-four subjects from advertisements in local newspapers and imparted them with training in meditation or progressive relaxation or were assigned to a control group. The participants were tested using the SCL-90, IPAT Anxiety Inventory and the Lehrer-Woolfolk Anxiety Symptom Questionnaire. Their behavior was also rated weekly by a spouse or roommate. The Progressive Relaxation and meditation treatments resulted in a significant reduction of stress symptomatology over time.

Lehrer, Woolfolk, and Rooney (1983) collected physiological and self-report data from sixty-one anxious subjects who were recruited from newspaper ads and randomly assigned to a progressive relaxation, mantra meditation or control group. Both progressive relaxation and meditation generated positive expectancies and produced decreases in a variety of self-reported symptoms and on EMG (Electromyogram), but no skin conductance or frontal EEG (Electroencephalogram) effects were observed. Progressive relaxation produced bigger decreases in forearm EMG responsiveness to stressful stimulation and a generally more powerful therapeutic effect than meditation. Meditation produced greater cardiac-orienting responses to stressful stimuli, greater absorption in the task and better motivation to practice than Progressive Relaxation but it also produced more reports of increased transient anxiety.

Kindlon (1983) randomly assigned thirty-five undergraduate volunteers to either a meditation group or a sleep/rest control group balanced for expectancy to compare the function of these treatments in the alleviation of test anxiety. Self-report, performance, and physiological indices were assessed, as moderated by gender,
Davidson and Schwartz (1984) suggested that different relaxation techniques (progressive relaxation, hypnotic suggestion, autogenic training, and meditation) activate different major modes or systems and that the effects of a particular relaxation technique can be meaningfully understood only after determining the type of dependent variable employed. For example, progressive relaxation (a somatic technique) was significantly superior to hypnotic relaxation, a cognitive technique on a number of somatic measures; while the results on a cognitive measure yielded no significant differences. They demonstrated that the cognitive and somatic contributions to anxiety can be meaningfully separated and they stated two general principles pertaining to relaxation and anxiety reduction that apply: first, the self-regulation of behavior (including voluntary focusing of attention) in a given mode will reduce (or inhibit) unwanted activity in that specific mode and second, the self-regulation of behavior in a given mode may, to a lesser degree, reduce unwanted activity in other modes. These researchers hypothesized that forms of Zen meditation that require that the person count his breaths or say a mantra in synchrony with breathing are particularly effective because they simultaneously attenuate both cognitive and somatic anxiety. They suggested that meditation involving the generation of cognitive events (TM's mantra) should elicit greater changes on measures of cognitive processing than meditation on somatic events (breathing), which would result in greater changes on measures of somatic activation.

Steptoe and Kearsley (1990) evaluated the influence of meditation and physical exercise on cognitive and somatic anxiety using 340 meditators, competitive athletes, recreational exercisers and sedentary controls. Results did not confirm that
meditation is associated with reduced cognitive anxiety or that exercise is linked with lower somatic anxiety.

Edwards (1991) conducted a meta-analysis to determine the effects of meditation and hypnosis techniques on psychometric measures of anxiety. The chief measure employed was Spielberger’s State-Trait Anxiety Inventory. The analysis included twenty-one hypnosis studies and fifty-four meditation studies. Both techniques were effective in reducing measures of state anxiety. However, for measures of trait anxiety, meditation was more effective.

Kabat-Zinn et al. (1992) screened twenty-two study participants with a structured clinical interview who were found to meet the DSM-III-R criteria for generalized anxiety disorder or panic disorder with or without agoraphobia. These subjects participated in an eight-week meditation-based stress reduction and relaxation program with a three-month follow-up period. The study found significant reductions in anxiety and depression scores and a reduction in panic symptoms after treatment for twenty of the subjects—changes that were maintained at follow-up.

Chamber, Lo, and Allen (2007) found that mindfulness meditation may not necessarily lead to increased positive affect, but may rather result in a more moderate, balanced emotional demeanor characterized by low levels of negative affect. Also the increased self-reported mindfulness was found to be significantly correlated with decreases in self-reported depressive symptoms and anxiety but increased self-reported positive affect. This was consistent with the literature which suggests an inverse relationship between rumination and psychopathology (Davidson et al., 2003; Shapiro, Schwartz, & Bonner, 1998). However, decreases in anxiety are found to be positively related to frequency of practice (Fling, Thomas, & Gallagher, 1981; Tjoa, 1975; Williams, Francis, & Durham, 1976). Peters, Benson, and Porter (1977) found
that less than three practice periods per week produced little change, whereas two
daily sessions appeared to be more practice than was necessary for many individuals
to achieve positive changes. Recent research has suggested that mindfulness is a more
effective remedy for coping with dysphoric mood than either rumination or distraction
(Broderick, 2005).

MEDITATION AND COGNITIVE PERFORMANCE

As stated earlier the variable cognitive performance has a wide scope which
includes cognitive/information processing efficiency, psychomotor efficiency,
working memory capacity and mental flexibility which enlists different mental
functions or resources. Therefore the ensuing literature review on the variable
cognitive performance includes studies dealing with perceptual and cognitive abilities
(field independence); reaction time and perceptual motor skills; concentration,
attention and memory.

Pelletier (1974) in the experimental testing of regular practitioners of TM and
non-meditating controls on several measures used to test field independence
(Autokinetic Test, Rod-and-Frame Test and the Embedded-Figures Test), found that
TM practitioners had a more increased perceptual acuity and better field
independence. Witkin (1977) refers to field dependence as an undifferentiated, global
style of perceiving things, whereas field independence is the ability to experience
items as distinct or independent of their background. An enhancement in the ability to
differentiate between different sets of stimuli and to appropriate attention among
different tasks demanding different attentional styles can be seen as one corollary of
field independence. Pelletier’s findings have been supported by other researchers
(e.g., Rani & Rao, 2000). Nolly (1975) found that meditating subjects perceived a
greater number of objects on a stimulus slide than the non meditating controls.
Martinetti (1976) concluded that practitioners of TM may have learned to focus their attention to a level at which thresholds for pertinent perceptual cues such as binocular disparity may be lowered. He stated that the concomitant increase in response sensitivity would account for the superiority of meditators at signal detection in the Ames Trapezoid Illusion where meditators were twice as sensitive as controls.

Dillbeck (1977) investigated the effects of the regular practice of TM on habitual patterns of visual perception and verbal problem solving. He hypothesized that two weeks of TM practice would tend to free the subjects from inhibitory effects of those patterns while allowing an improvement in their efficient use when appropriate. The subjects in this study were sixty-nine university students who either practiced TM, relaxed or added nothing to their daily schedule for two-week periods. The general hypothesis was supported for tasks involving a tachistoscopic identification of card-and-letter sequence stimuli but not for a verbal problem-solving task involving anagram solutions.

Pagano and Frumkin (1977) reported that TM meditators demonstrated enhanced ability to remember and discriminate musical tones. Udupa (1973), and Shaw and Kolb (1977), also reported that meditators seemed to have better auditory receptivity and perceptual discrimination than controls. Walsh (1978) reported that meditation reduced perceptual noise. Blasdell (1977), Orme-Johnson (1973), and Orme-Johnson, Clements, and Haynes (1977) found that TM increased perceptual motor performance. Linden (1973) found that regular practice of meditation is associated with a significant enhancement of attentive ability, as assessed by the Embedded Figures Test and the Rod and Frame Tests. Williams and Herbert (1976), however, conducted a study that found no differences in perceptual motor ability within subjects practicing meditation.
Shapiro (1980), and Shapiro and Giber (1978) reported enhanced perceptual sensitivity. Domitor (1978) found no support for the hypothesis that meditation favorably affects perceptual change as measured by the Holtzman Inkblot Test and the Embedded Figures Test.

Verma, Jayashankarappa, and Palani (1982) gave twenty-three TM practitioners and fifteen controls ten cognitive psychological tests. Statistically significant improvements were noted in the coding, time factor and Raven standard progressive matrices tests, with improvement in the arithmetic test falling just short of significance. On the other tests, which measured less complicated mental functions, such as number 9 cancellations and digit span, the influence of TM on performance was negligible.

Wandhofer and Plattig (1973), Appelle and Oswald (1974), Blackwell et al. (1976), and Shaw and Kolb (1977) concluded that the increased alertness developed through meditation resulted in improvement of reaction time.

Williams and Vickerman (1976) gave forty-six college female volunteers sixty-six ten-second trials on the pursuit rotor task in three practice sessions (eighteen, thirty, and eighteen trials per session). After the first eighteen trials, the twenty-three subjects who were practiced Transcendental Meditators meditated for a twenty-minute period followed by a five-minute waking phase prior to performing a further thirty trials on the rotor. A four-minute rest was taken before resuming practice for the final eighteen trials. The other twenty-three subjects, who were not meditators, followed the same procedures, except instead of meditating they sat quietly with closed eyes. In terms of performance, learning, reminiscence, and intra-individual variability, the two groups were similar. These results were not in accordance with the expectations that these parameters would reflect the facilitative effects of
Transcendental Meditation on alertness, awareness, consistency, and resistance to stress. While Williams and Vickerman concluded that the practice of Transcendental Meditation does not appear to benefit acquisition of fine perceptual motor skill, they suggested that more investigation might produce a better understanding of meditation's effects on perceptual motor behavior.

Holt, Caruso, and Riley (1978) reported that TM increased the speed of visual-choice reaction time. Sinha, Prasad, and Sharma (1978) found a consistent decline in reaction time following vipashyana meditation for three groups of police officers.

Warshall (1980) found a significant reduction in reflex latency and reflex motor time in TM practitioners, indicating increased peripheral neurological efficiency. Heil (1983) concluded that the practice of meditation enhances visual imagery ability. Robertson (1983) assessed fractionated reaction time for fourteen subjects to determine the short- and long-term effects of TM on neuromuscular integration. Results indicated no significant immediate pre- to post treatment effect, but a significant cumulative effect over days. Faster total reaction time was noted due to a decrease in premotor time, although an increase in motor time was also observed.

Jedrczak, Toomey, and Clements (1986) found that the number of months of practice of the TM-Sidha program significantly predicted higher performance on two measures of perceptual motor speed.

Kindler (1979) studied 230 subjects in forty-six five-person teams in group problem-solving effectiveness, and found that meditation teams improved more from pretest to posttest than control teams and that meditators felt less tense and had a greater sense of effective teamwork than control teams.

Sabel (1980) assigned sixty practitioners of TM to two treatment groups. One group meditated for twenty minutes while the other read a text quietly. Both groups
were tested before and after treatment to measure their concentration ability. Meditation had no measurable short-term effect on concentration and the subjects' experience of meditation was not correlated with their concentration score.

Yuille and Sereda (1980) studied sixty-six females and seventy males who responded to ads in a university newspaper. All subjects were given pretests and posttests of short- and long-term memory, attention, reading skills, and intelligence. After the pretest, each subject was given individual training in TM, Shavasana yoga or pseudo meditation and was asked to practice meditation twice a day, monitoring his or her practice with individual diaries. The practice of meditation had no systematic effect on the variables assessed.

Fiebert and Mead (1981) randomly assigned twenty students in an introductory psychology class to an experimental group that was taught "actualism" meditation and asked to practice before studying and before exams, and a control group that was taught the technique but asked to practice at other times. There were no differences between the groups in mean weekly study time, but the experimental group performed significantly better on examinations than the control group.

Valentine and Sweet (1999) found that both concentrative and mindfulness practitioners had improved sustained attention on a continuous performance task (Wilkin’s counting test) in contrast to control participants. However, mindfulness practitioners displayed less distraction to unexpected stimuli. The emphasis of mindfulness practice on the present moment potentially enhances the capacity for sustained attention, attention switching and inhibition of elaborative processing (Bishop et al., 2004).

Travis, Tecce, and Guttman (2000) related performance on an auditory-response/letter-recall task of TM practitioners to self-reported levels of transcendence
experienced during meditation. They found that participants who had reported more transcendent experiences showed quicker reaction times, reduced effects of distraction and according to EEG and EMG measurements, a heightened physiological preparedness for response.

**MEDITATION, ANXIETY AND COGNITIVE PERFORMANCE**

Davidson, Goleman, and Schwartz (1976), and Davidson, Schwartz, and Rothman (1976) mapped the attentional absorption and trait anxiety in fifty-eight subjects divided into four groups: controls who were interested in but did not practice meditation; beginners who had meditated for one month or less; short-term meditators who had practiced regularly for one to twenty-four months; meditators who had practiced for more than two years. Subjects were administered the Shor Personal Experiences Questionnaire, the Tellegen Absorption Scale, and the Spielberger State-Trait Anxiety Inventory. The results indicated reliable increases in measures of attentional absorption, in conjunction with a reliable decrement in trait anxiety across groups as a function of length of time meditating. They also reported that meditators seemed to have better auditory receptivity and perceptual discrimination than controls.

Yesavage and Rolf (1984) implemented two divided-attention tasks involving auditory-response and letter-recall tasks on a group of elderly people and found that a reduction in anxiety through relaxation techniques improved their reaction times on both the tasks.

Alexander, Swanson, Rainforth, Carlisle, Todd, and Oates Jr. (1993) conducted an experimental study where employees who learned TM were compared to controls similar in worksite, job position, demographic and pretest characteristics. The results showed that regular meditators improved significantly more than controls.
(with irregular meditators scoring in between) on multiple measures of stress and employee development, including reduced physiological arousal (measured by skin conductance levels) during and outside TM practice - decreased trait anxiety, job tension, insomnia and fatigue, cigarette and hard liquor use; improved general health (and fewer health complaints) and enhanced employee effectiveness, job satisfaction and work/personal relationships.

Shapiro and Schwartz (2000), Teasdale (1999), and Teasdale, Segal, and Williams (1995, 2003) found that working together with the processes of mindfulness training, amplify one’s potential for self-regulation and allow attention to be redirected from depressive or anxious rumination back to the experience of the present moment. This may result in decreased negative affect and improved psychological health (Davidson et al., 2003; Shapiro, Schwartz, & Bonner, 1998).

OVERVIEW OF THE LITERATURE REVIEW

The foregoing survey of literature deduces the following characteristics of the literature surveyed. Most of the studies that have probed the relationship between meditation and anxiety have focused on the effect of meditation on anxiety amongst non clinical participants. These studies have assessed the effectiveness of meditation including other relaxation strategies like systematic desensitization and progressive relaxation. In these assessments, the participants who practiced meditation showed greater anxiolytic response than progressive relaxation and controls. Amongst the clinically anxious subjects, meditation was found to be equally effective as the technique of self-hypnosis.

The findings of the studies that tested the relationship between meditation and cognitive performance consistently indicated the effectiveness of meditation in improving attention, field independence and reaction time. However, the findings of
these studies that tested this relationship show inconsistencies regarding the impact of meditation on perceptual acuity and perceptual motor ability. These studies have also suggested the need for further investigations to probe the overall status of meditation regarding these indices of cognitive performance (perceptual acuity and perceptual motor ability).

The studies that probed the impact of meditation on both anxiety and cognitive performance indicate the effectiveness of meditation in reducing anxiety and improving the cognitive performance indices of attention, reaction time, perceptual acuity and mental health.

The studies reviewed here in general point to the need for further studies that probe the prolonged impact of meditation on the variables of anxiety as well as cognitive performance for greater than six weeks. They also explicitly call for studies involving multiple posttests or repeated measures of these variables to understand the long term impact of meditation on them. The present study proposes to contribute towards covering some of these existing lacunas.