Chapter-II

REVIEW OF RELATED LITERATURE

The related literature reviewed for better understanding of the problem investigated and to interpret the results is presented in this chapter. The reviews are classified under the following headings:

1. Studies related to Yogic Practices on Physiological Variables.
2. Studies related to Yogic Practices on Biochemical Variables.
3. Studies related to Yogic Practices on Psychological Variables
4. Studies related to Tai chi Training on Physiological Variables.
5. Studies related to Tai chi Training on Biochemical Variables.
6. Studies related to Tai chi Training on Psychological Variables
7. Studies related to Yogic Practices and Football Players
8. Studies related to Yogic Practices and Tai chi training on selected Variables
9. Summary of the literature.

2.1 Studies Related to Yogic Practices on Physiological Variables

Anna, et al., (2012), investigated the changes in selected indices of anaerobic capacity, the ability to maintain body balance and the height of elevating body's centre of mass, and maximum power output in lower limbs during countermovement jump (CMJ) after 6 months of participation in yoga classes in Ashtanga Vinyasa system (Power Yoga). The study included 24 untrained women who volunteered to participate in a half-year experiment. The analysis focused on 12 women who participated in the classes until the experiment ended. The Wingate test was used to evaluate anaerobic capacity. In order to measure the functional state of vestibular organ the authors used a stabilographic method. Measurements of power output in the lower limbs and the height of elevation of

the centre of mass in CMJ jumps were carried out using a dynamometric platform. The 6 months of training in the Power Yoga system considerably improved the height of CMJ jumps from 0.276 ± 0.048 m to 0.308 ± 0.038 m ($p<0.05$). These changes were not accompanied by significant increases in maximum power output (1286 ± 200 W and 1327 ± 2134 W before and after, respectively; $p>0.05$). Practicing Power Yoga does not induce changes in the anaerobic capacity and the functional state of the vestibular organ in women.

Conducted a study on heart rate variability changes during high frequency yoga breathing and breathe awareness (**Telles, et al., 2011**). Pre and post comparison after one minute of high frequency yoga breathing (HFYB) suggested that the HFYB modifies the autonomic status by increasing sympathetic modulation, but its effect during the practice was not assessed. For this Thirty-eight male volunteers with group average age ± S.D., 23.3 ± 4.4 years were each assessed on two separate days in two sessions, (i) HFYB and (ii) breathe awareness. Each session was for 35 minutes, with 3 periods, i.e., pre (5 minutes), during HFYB or breathes awareness (15 minutes) and post (5 minutes). The result showed that There was a significant decrease in NN50, pNN50 and the mean RR interval during and after HFYB and after breath awareness, compared to the respective 'pre' values ($p < 0.05$) (repeated measures ANOVA followed by post-hoc analysis). The LF power increased and HF power decreased during and after breath awareness and LF/HF ratio increased after breath awareness ($p < 0.05$). And they concluded the results suggest that there was reduced parasympathetic modulation during and after HFYB and increased sympathetic modulation with reduced parasympathetic modulation during and after breath awareness.

He conducted a study on immediate effect of slow pace breathing exercise Bhramari pranayama on blood pressure and heart rate. In this study was carried out to evaluate the immediate effect Bhramari pranayama, a slow breathing exercise for 5 minutes on heart rate and blood pressure. Heart rate and blood pressure of volunteers were recorded. The subject was directed to inhale slowly up to the maximum for about 5 seconds and then to exhale slowly up to the maximum for about 15 sec keeping two thumbs on two external auditory canal, index and middle finger together on two closed

eyes and ring finger on the two sides of the nose. During exhalation the subject must chant the word "O-U-M" with a humming nasal sound mimicking the sound of a humming wasp, so that the laryngeal walls and the inner walls of the nostril mildly vibrate (Bhramari pranayama, respiratory rate 3/min). After 5 minutes of this exercise, the blood pressure and heart rate were recorded again. Both the systolic and diastolic blood pressure was found to be decreased with a slight fall in heart rate. Fall of diastolic pressure and mean pressure were significant. The result indicated that slow pace Bhramari pranayama for 5 minutes, induced parasympathetic dominance on cardiovascular system (**Pramanik, et al., 2010**).

In 1998 **Seshien,** conducted a study on the effect of pranayma and transcendental meditation on the pulse rate and blood pressure of the male students of the Sourastra College, Madurai. For first group performed pranayama, the second group performed transcendental meditation and the third group performed pranayama and transcendental meditation. Subjects in each group were trained with respective programmers for a period of six weeks, five days a week from Monday to Friday and two sessions of 20 minutes duration both in the morning and in evening. Prior to and at the end of the training period all the subjects were tested for pulse rate and blood pressure. The result showed that the pranayama reduced the blood pressure only combined pranayama and transcendental meditation showed very good effect on all the physiological parameters.

Studied 50 shooters of the Indian Army (age 20-30 years). Out of them, 30 shooters were given training in the techniques of pranayama and kriya for 3 weeks. The rest served as control. Breath-holding time, lung function status and shooting performance were measured before and after the training in both the groups. Authors found highly significant improvement ($p<0.001$) in all the three variables. **Kapoor, et al., (2008),** concluded that pranayama and kriya are efficacious for better performance of shooters.

Prakash, et al., (2007), conducted tests to determine if yoga and athletic activity (running) are associated with better lung functions as compared to subjects with

sedentary lifestyles and how athletes do and yogis differ in lung function. Spiro metric parameters were assessed in randomly selected 60 healthy male, non-smoking non-obese subjects athletes, yogis and sedentary workers. It was concluded that, yogis and athletes had similar lung functions. Involvement in daily physical activity or sort preferably yoga can help in achieving better pulmonary function.

Evaluated (**Pramanik, et al., 2009**), the immediate effect of slow pace bhastrika pranayama (respiratory rate 6/min) for 5 minutes on heart rate and blood pressure and the effect of the same breathing exercise for the same duration of time (5 minutes) following oral intake of hyoscine-N-butylbromide (Buscopan), a parasympathetic blocker drug. Heart rate and blood pressure of volunteers (n = 39, age = 25-40 years) was recorded following standard procedure. First, subjects had to sit comfortably in an easy and steady posture (sukhasana) on a fairly soft seat placed on the floor keeping head, neck, and trunk erect, eyes closed, and the other muscles reasonably loose. The subject is directed to inhale through both nostrils slowly up to the maximum for about 4 seconds and then exhale slowly up to the maximum through both nostrils for about 6 seconds. The breathing must not be abdominal. These steps complete one cycle of slow pace bhastrika pranayama (respiratory rate 6/min). During the practice the subject is asked not to think much about the inhalation and exhalation time, but rather was requested to imagine the open blue sky. The pranayama was conducted in a cool, well-ventilated room (18-20 degrees C). After 5 minutes of this breathing practice, the blood pressure and heart rate again were recorded in the aforesaid manner using the same instrument. The other group (n = 10) took part in another study where their blood pressure and heart rate were recorded following half an hour of oral intake of hyoscine-N-butylbromide 20 mg. Then they practiced the breathing exercise as stated above, and the abovementioned parameters were recorded again to study the effect of parasympathetic blockade on the same pranayama. It was noted that after slow bhastrika pranayamic breathing (respiratory rate 6/min) for 5 minutes, both the systolic and diastolic blood pressure decreased significantly with a slight fall in heart rate. No significant alteration in both blood pressure and heart rate was observed in volunteers who performed the same breathing exercise for the same duration following oral intake of

hyoscine-N-butylbromide. Vagal cardiac and pulmonary mechanisms are linked, and improvement in one vagal limb might spill over into the other. Baroreceptor sensitivity can be enhanced significantly by slow breathing (supported by a small reduction in the heart rate observed during slow breathing and by reduction in both systolic and diastolic pressure). Slow pace bhastrika pranayama (respiratory rate 6/min) exercise thus shows a strong tendency to improving the autonomic nervous system through enhanced activation of the parasympathetic system.

Singh Sisodia and Tomar (2009), done a research on "Effect of Anuloma Viloma Pranayama on Selected Respiratory Variables". The study contains the following. The study was conducted on selected respiratory variables on 30 male college students, 15 students in each group (experimental & control) with the purpose to investigate the effect of anuloma viloma pranayama on selected respiratory variables. The selected respiratory variables were vital capacity, peak flow rate, positive breath holding time & negative breath holding time. To determine the effect of anuloma viloma pranayama on selected respiratory variables, analysis of covariance (ANCOVA) was employed at 0.05 level of significant. On the basis of results, the following conclusions were drawn: Significance improvements were found in relation to vital capacity (189.37), peak flow rate (13.44) & negative breath holding time (47.17). No significance effect was found on male students in relation to positive breath holding time (1.042). Keyword: Pranayama, Vital capacity & peak flow rate.

Examined the effect of walking exercise in order to provide a method for overcoming bulimia nervosa in obese young women suffering from bulimia nervosa (**Pramanik, et al.,2009**). Twenty obese women with bulimia nervosa (body mass index [BMI]>30) and a mean age of 22.00 ± 1.50 years volunteered to participate in this study. They were randomly assigned to exercise (n=10) and control (n=10) groups. Both groups underwent anthropometric measurements and blood analysis before and after the training program. Exercise program included 30-minute walking sessions at 50-75% of maximal heart rate, 3 days per week and for 2 months. After 2 months significant changes were observed in all anthropometric variables ($P<0.001$). Percent body fat, fat mass, BMI,

body weight and lean mass changes in response to training were significant in the exercise group (P<0.001). This study demonstrated that moderate aerobic exercises such as moderate walking are suitable behavior therapies for overcoming bulimia nervosa in obese young women.

James and Raub, (2002), examined the yoga has become increasingly popular in Western cultures as a means of exercise and fitness training; however, it is still depicted as trendy as evidenced by an April 2001 *Time* magazine cover story on "The Power of Yoga." There is a need to have yoga better recognized by the health care community as a complement to conventional medical care. Over the last 10 years, a growing number of research studies have shown that the practice of Hatha Yoga can improve strength and flexibility, and may help control such physiological variables as blood pressure, respiration and heart rate, and metabolic rate to improve overall exercise capacity. This review presents a summary of medically substantiated information about the health benefits of yoga for healthy people and for people compromised by musculoskeletal and cardiopulmonary disease.

He conducted study on effect of raja yoga and pranayama on selected physical and physiological variable of adults. **Karunakaran and Ramesh (2009),** objective of the study were to find out the physical and physiological variable. The selected variables of Flexibility in measure the sit and reach box. For this study thirty boys in the age group of 23 to 27 years were selected form Pondicherry University, Pondicherry. The subjects were divided into two groups namely control group and experimental group. The experimental group was yogic pranayama and meditation for a period of twelve weeks, both morning and evening on five days a week. The control group did not participate in yogic pranayama and meditation training programme. The collected data were statistically analyzed by using analysis of covariance (ANCOVA). The Experiment group had a significant improvement on the selected physical and physiological variables except systolic and diastolic blood pressure than control group.

Kristal, Littman, Benitez and White, (2005), examined whether yoga practice is associated with lower mean 10-year weight gain after age 45. Participants

included 15,550 adults, aged 53 to 57 years, recruited to the Vitamin and Lifestyle (VITAL) cohort study between 2000 and 2002. Physical activity (including yoga) during the past 10 years, diet, height, and weight at recruitment and at ages 30 and 45. All measures were based on self-reporting, and past weight was retrospectively ascertained. Multiple regression analyses were used to examined covariate-adjusted associations between yoga practice and weight change from age 45 to recruitment, and polychotomous logistic regression was used to examine associations of yoga practice with the relative odds of weight maintenance (within 5%) and weight loss (> 5%) compared to weight gain. Yoga practice for four or more years was associated with a 3.1-lb lower weight gain among normal weight (BMI < 25) participants [9.5 lbs versus 12.6 Ibs] and an 18.5-lb lower weight gain among overweight participants [-5.0 lbs versus 13.5 Ibs] (both P for trend <.001). Among overweight individuals, 4+ years of yoga practice was associated with a relative odds of 1.85 (95% confidence interval [CI] 0.63-5.42) for weight maintenance (within 5%) and 3.88 (95% Cl 1.30-9.88) for weight loss (> 5%) compared to weight gain (P for trend .026 and .003, respectively). Regular yoga practice was associated with attenuated weight gain, most strongly among individuals who were overweight. Although causal inference from this observational study is not possible, results are consistent with the hypothesis that regular yoga practice can benefit individuals who wish to maintain or lose weight.

In 2010 **Mody** assessed the cardio-respiratory and metabolic responses of four rounds of Surya Namaskar, a typical amount performed by practitioners, to determine its potential as a training and weight loss tool. Six healthy Asian Indian men and women (18–22 years) who had trained in Surya Namaskar for over two years participated in the study. Testing was completed in a single session lasting about 30 min. To measure heart rate and oxygen consumption while performing the four rounds, participants were connected to a heart rate monitor and the Oxycon Mobile Metabolic System. Participants exercised at 80% of age-predicted maximal heart rate (HRmax) during Round 2, 84% during Round 3, and 90% during Round 4. Average intensity during the four rounds was 80% HRmax, sufficient to elicit a cardio-respiratory training effect. Oxygen consumption averaged 26 ml/kg/min during each round, resulting in an energy expenditure of

230 kcals during a 30 min session for a 60 kg individual. Regular practice of Surya Namaskar may maintain or improve cardio-respiratory fitness, as well as promote weight management.

Monyeki, et al., (2005), determined the relationships between the body composition characteristics, body mass index (BMI), sum of skinfolds (SSF), % body fat (%BF), fat-free mass (FFM) and waist-to-hip ratio (WHR), and nine physical fitness items in undernourished rural primary school children in Ellisras, South Africa. A cross-sectional study consisted of 462 boys and 393 girls who were aged 7-14 y. Five body composition measures were assessed: BMI, SSF, %BF, FFM and WHR. Nine physical fitness test items were assessed: standing long jump, bent arm hang, sit-ups, 10 x 5 m shuttle run, 50 m sprint, 1600 m run, flamingo balance, sit and reach, plate tapping. BMI was highly correlated with FFM ($r = 0.7$, $P < 0.001$). In line with findings from Western countries, regression coefficients (B) showed that children with higher BMI or SSF performed worse in bent arm hang (girls, $B = -0.84$, $P < 0.001$, and $B = -0.06$, $P = 0.02$, respectively) and in 1600m run ($B = 6.68$, $P < 0.001$). BMI was significantly associated with flamingo balance ($B = 0.26$, $P = 0.04$). WHR was positively associated with bent arm hang ($B = 9.37$, $P = 0.03$), and inversely with sit and reach ($B = -7.48$, $P = 0.01$). In contrast, significant relationships were found between BMI and standing long jump ($B = 0.74$, $P = 0.04$), sit and reach ($B = 0.51$, $P < 0.001$), flamingo balance ($B = 0.26$, $P = 0.04$) and plate tapping ($B = -19$, $P = 0.01$). SSF was significantly associated with sit and reach ($B = 0.04$, $P = 0.03$). Significant inverse associations were found between FFM and bent arm hang (girls, $B = -0.06$, $P = 0.05$), 1600 m run (girls, $B = -2.33$, $P = 0.003$) and 50 m run (boys, $B = -0.11$, $P = 0.006$). FFM was significantly associated with standing long jump (boys, $B = 0.99$, $P < 0.001$; girls, $B = 0.73$, $P < 0.001$), flamingo balance ($B = 0.17$, $P < 0.001$), and with sit and reach (boys, $B = 0.59$, $P = 0.03$). In the present study in undernourished children, body composition was significantly related to physical fitness, but not always in the expected direction. It is therefore important to note that in this population, BMI should not be interpreted as a measure of fatness/overweight, but rather as an indicator of muscle mass.

Sinha, et al., (2004), observed critically the energy cost and different cardio respiratory changes during the practice of SN. Twenty one male volunteers from the Indian Army practiced selected Yogic exercises for six days in a week for three months duration. The Yogic practice schedule consisted of Hatha Yogic Asanas (28 min), Pranayama (10.5 min) and Meditation (5 min). In the Yogic practice schedule 1st they practiced Kapal Bhathi (breathing maneuvers) for 2 min then Yogamudra (yogic postural exercise) for 2 min, after that they took rest until oxygen consumption and heart rate (HR) came to resting value. Subsequently subjects performed SN for 3 min 40 seconds on an average. After three months of training at the beginning of the fourth month subjects performed entire Yogic practice schedule in the laboratory as they practiced during their training session and experiments were carried out. Their pulmonary ventilation, carbon dioxide output, Oxygen consumption, HR and other cardio respiratory parameters were measured during the actual practice of SN. Oxygen consumption was highest in the eighth posture (1.22 ± 0.073 1 min–1) and lowest in the first posture (0.35 ± 0.02 1 min–1). Total energy cost throughout the practice of SN was 13.91 kcal and at an average of 3.79 kcal/min. During its practice highest HR was 101 ± 13.5 b.p.m. As an aerobic exercise SN seemed to be ideal as it involves both static stretching and slow dynamic component of exercise with optimal stress on the cardio respiratory system.

Studied the ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, were studied to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardio respiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased by 31%, 19%, and 28% ($p<0.05$), respectively, whereas isometric muscular endurance for knee flexion increased 57% ($p<0.01$). Ankle flexibility, shoulder elevation, trunk extension, and trunk

flexion increased by 13% ($p<0.01$), 155% ($p<0.001$), 188% ($p<0.001$), and 14% ($p<0.05$), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively ($p<0.01$). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness (**Karunakaran and Ramesh 2009**).

2.2 Studies Related to Yogic Practices on Bio-chemical Variables

Dhananjai, et al., (2010), studied the effect of a yoga practice for 12 weeks on lipid profiles of 56 obese subjects (32 females and 24 males) age ranged from 20 to 45 yrs were evaluated. Results revealed a significant ($p<0.01$) decrease in anthropometric variables (weight, body mass index, waist circumference and hip circumference). Further, total cholesterol, triglyceride, very low density lipoprotein, low density lipoprotein and fasting plasma glucose decreased significantly ($p<0.01$) while high density lipoprotein increase significantly when compare to the basal variables before intervention given ($p<0.01$). A significant and positive correlation was evident among pretreatment anthropometric variables ($p<0.01$) while most of the lipid profiles parameters also showed a significant ($p<0.05$ or $p<0.01$) positive or negative correlation with each other. The pretreatment weight ($r=0.49$; $p<0.01$), waist circumference ($r=0.39$; $p<0.01$) and hip circumference ($r=0.26$; $p<0.05$) showed significant and positive correlation with pretreatment Triglyceride. The change (improvement) in weight and TG were significantly ($r=0.49$, $p<0.01$) associated with each other. However, the improvement in all anthropometric variables and lipid profiles parameters of females and males were found to be similar ($p>0.05$). This pilot study found yoga practices effective in reducing weight. Further, this weight loss is also found to be associated well with the improvements in lipid profiles. Investigations with large sample size, different covariates and follow up of outcomes are needed to validate the effect of other yoga exposures.

Prasad, et al., (2006), conducted on normal healthy volunteers, 41 men and 23 women, to evaluate the impact of Pranayama and Yoga asanas on blood lipid profiles and free fatty acids, in two stages. In stage-I, Pranayama was taught for 30 days and in stage-II, yogic practices were added to Pranayama for another 60 days. A Significant

reduction was observed in triglycerides, free fatty acids and VLDL-cholesterol in men and free fatty acids alone were reduced in women at the end of stage-I. A significant elevation of HDL- cholesterol was seen only in the men at the end of stage-I. At the end of stage-II, free fatty acids increased in both men and women, and women demonstrated a significant fall in serum cholesterol, triglycerides, LDL- and VLDL-cholesterol. The results indicated that HDL-cholesterol was elevated in men with Pranayamam, while triglycerides and LDL- cholesterol decreased in women after yoga asanas. The results of the present study indicate that Pranayama and yoga asanas can be helpful in patients with lipid metabolism disorders such as coronary artery disease, diabetes mellitus and dyslipidemia etc.

He identified the effects of aerobic exercise and yoga on body composition and lipid metabolism in abdominal obese women. Using one-group pretest-posttest design, a convenience sample of 23 women who had abdominal obesity (greater than 32 inches of waist circumference) was recruited in a local area of P city and participated in 1 hour of aerobic exercise and yoga program twice a week for 12 weeks. Body composition was measured by body mass index, body fat ratio, waist and hip circumference, and waist-hip ratio; and lipid metabolism was measured with blood pressure, total cholesterol and triglycerides. At pretest, mean age of the subjects was 48.7(SD=9.5) and body fat ratio was 33%, and waist-hip ratio was .85. By paired t-tests, waist circumference and waist-hip ratio were significantly decreased before and after the program but body mass index, blood pressure, and the level of lipid metabolism did not change(**Sukhee, Lee and Kim, 2006**).

2.3 Studies Related to Yogic Practices on Psychological Variables

Sayyed et al., (2010), saw the effect of Sudarshan Kriya Yoga on lipid profile, pulmonary function and hemoglobin concentration; conducted a workshop of 8 days consisting of 150 participants. Out of which 55 were included in the study group. Our results show that after practicing Sudarshan Kriya =, there is decrease in Total cholesterol, LDL-C along with significant increase in HDL-C. There are significant changes in pulmonary function (forced vital capacity, expiratory volume in the first

second, peak expiratory flow rate and maximum voluntary ventilation), but statistically non-significant changes in hematological parameters. The present study confirmed the positive effect of Sudarshan Kriya Yoga on lipid profile and pulmonary function over period of 8 days.

Studied the fifty-seven male volunteers (group average age +/- S.D., 26.6 +/- 4.5 years) the immediate effect of two yoga relaxation techniques was studied on memory and state anxiety (**Subramanya and Telles, 2009**). All participants were assessed before and after (i) Cyclic meditation (CM) practiced for 22:30 minutes on one day and (ii) an equal duration of Supine rest (SR) or the corpse posture (shavasana), on another day. Sections of the Wechsler memory scale (WMS) were used to assess; (i) attention and concentration (digit span forward and backward), and (ii) associate learning. State anxiety was assessed using Spielberger's State-Trait Anxiety Inventory (STAI). There was a significant improvement in the scores of all sections of the WMS studied after both CM and SR, but, the magnitude of change was more after CM compared to after SR. The state anxiety scores decreased after both CM and SR, with a greater magnitude of decrease after CM. There was no correlation between percentage change in memory scores and state anxiety for either session. A cyclical combination of yoga postures and supine rest in CM improved memory scores immediately after the practice and decreased state anxiety more than rest in a classical yoga relaxation posture (shavasana).

In 2007, **Kiellgren, et al.,** designed a protocol that can investigate whether SK&P can lead to increased feeling of wellness in healthy volunteers. Participants were recruited in a small university city in Sweden and were instructed in a 6-day intensive program of SK&P which they practiced daily for six weeks. The control group was instructed to relax in an armchair each day during the same period. Subjects included a total of 103 adults, 55 in the intervention (SK&P) group and 48 in the control group. Various instruments were administered before and after the intervention. Hospital Anxiety Depression Scale measured the degree of anxiety and depression, Life Orientation Test measured dispositional optimism, Stress and Energy Test measured individual's energy and stress experiences. Experienced Deviation from Normal State

measured the experience of altered state of consciousness. There were no safety issues. Compliance was high (only 1 dropout in the SK&P group, and 5 in the control group). Outcome measures appeared to be appropriate for assessing the differences between the groups. Subjective reports generally correlated with the findings from the instruments. The data suggest that participants in the SK&P group, but not the control group, lowered their degree of anxiety, depression and stress, and also increased their degree of optimism (ANOVA; $p < 0.001$). The participants in the yoga group experienced the practices as a positive event that induced beneficial effects. These data indicate that the experimental protocol that is developed here is safe, compliance level is good, and a full scale trial is feasible. The data obtained suggest that adult participants may improve their wellness by learning and applying a program based on yoga and yogic breathing exercises; this can be conclusively assessed in a large-scale trial.

Telles, et al., (2009), examined the yoga techniques practiced for varying durations have been shown to reduce state anxiety. In this study, there were 300 naive-to-yoga persons of both sexes who were attending a yoga therapy center in north India for stress relief as day visitors and were not residing at the center. They were assigned to two groups, yoga practice and yoga theory, and their state anxiety was assessed before and after a 2-hr. yoga session. A significant reduction in scores on state anxiety was found in the yoga practice group (14.7% decrease), as well as in the yoga theory group (3.4% decrease). The difference in scores following the sessions was statistically significant. Hence, yoga practice as well as learning about theoretical aspects of yoga appears to reduce state anxiety, with a greater reduction following yoga practice.

Compared yoga and relaxation as treatment modalities at 10 and 16 weeks from study baseline to determine if either of modality reduces subject stress, anxiety, blood pressure and improve quality of life (**Smith, et al., 2007**). A randomized comparative trial was undertaken comparing yoga with relaxation. One hundred and thirty-one subjects with mild to moderate levels of stress were recruited from the community in South Australia. Ten weekly 1- h sessions of relaxation or hatha yoga changes in the State Trait Personality Inventory sub-scale anxiety, General Health

Questionnaire and the Short Form-36. Following the 10 week intervention stress, anxiety and quality of life scores improved over time. Yoga was found to be as effective as relaxation in reducing stress, anxiety and improving health status on seven domains of the SF-36. Yoga was more effective than relaxation in improving mental health. At the end of the 6 week follow-up period there were no differences between groups in levels of stress, anxiety and on five domains of the SF-36. Vitality, social function and mental health scores on the SF-36 were higher in the relaxation group during the follow-up period. Yoga appears to provide a comparable improvement in stress, anxiety and health status compared to relaxation.

Brown and Gerbarg, (2005), studied the mind-body interventions are beneficial in stress-related mental and physical disorders. Current research is finding associations between emotional disorders and vagal tone as indicated by heart rate variability. A neurophysiologic model of yogic breathing proposes to integrate research on yoga with polyvagal theory, vagal stimulation, hyperventilation, and clinical observations. Yogic breathing is a unique method for balancing the autonomic nervous system and influencing psycho logic and stress-related disorders. Many studies demonstrate effects of yogic breathing on brain function and physiologic parameters, but the mechanisms have not been clarified. Sudarshan Kriya yoga (SKY), a sequence of specific breathing techniques (ujjayi, bhastrika, and Sudarshan Kriya) can alleviate anxiety, depression, everyday stress, post-traumatic stress, and stress-related medical illnesses. Mechanisms contributing to a state of calm alertness include increased parasympathetic drive, calming of stress response systems, neuro endocrine release of hormones, and thalamic generators. This model has heuristic value, research implications, and clinical applications.

Hale, et al., (2002), examined the state anxiety responses to 60 minutes of cross training were examined in 16 collegiate athletes (12 women, four men). Each subject completed two cross training exercise sessions (30 minutes of resistance training, 30 minutes of bicycle ergometry) in which the order of the exercises was reversed, with a minimum of one week between sessions. Each exercise mode was completed at about

70% of maximum. State anxiety (SAI-Y1) was assessed five minutes before, and 0, 10, and 60 minutes after exercise. Repeated measures analysis of variance showed a significant ($p<0.05$) main effect for time. However, the main effect for order and the order by time interaction were not significant. Post hoc analysis showed that state anxiety was reduced ($p<0.05$) from baseline (mean (SD) = 34.8 (7.9)) at 10 minutes (32.1 (7.5)) and 60 minutes (30.4 (5.9)) after exercise, but not at 0 minutes (33.8 (6.9)). The results indicate that combined sessions of aerobic and resistance exercises are associated with reductions in state anxiety, and that the order in which the exercise is completed does not influence this response.

Dunn, et al., (2001), studied the scientific evidence for a dose-response relation of physical activity with depressive and anxiety disorders. Computer database searches of MEDLINE, PsychLit, and Internet and personal retrieval systems to locate population studies, randomized controlled trials (RCTs), observational studies, and consensus panel judgments were conducted. Observational studies demonstrate that greater amounts of occupational and leisure time physical activity are generally associated with reduced symptoms of depression. Quasi-experimental studies show that light-, moderate-, and vigorous-intensity exercise can reduce symptoms of depression. However, no RCTs have varied frequency or duration of exercise and controlled for total energy expenditure in studies of depression or anxiety. Quasi-experimental and RCTs demonstrate that both resistance training and aerobic exercise can reduce symptoms of depression. Finally, the relation of exercise dose to changes in cardio respiratory fitness is equivocal with some studies showing that fitness is associated with reduction of symptoms and others that have demonstrated reduction in symptoms without increases in fitness. All evidence for dose-response effects of physical activity and exercise come from B and C levels of evidence. There is little evidence for dose-response effects, though this is largely because of a lack of studies rather than a lack of evidence. A dose-response relation does, however, remain plausible.

Strohle, (2009), reviewed the currently available literature with respect to (1) the association of physical activity, exercise and the prevalence and incidence of

depression and anxiety disorders and (2) the potential therapeutic activity of exercise training in patients with depression or anxiety disorders. Although the association of physical activity and the prevalence of mental disorders, including depression and anxiety disorders have been repeatedly described, only few studies examined the association of physical activity and mental disorders prospectively. Reduced incidence rates of depression and (some) anxiety disorders in exercising subjects raise the question whether exercise may be used in the prevention of some mental disorders. Besides case series and small uncontrolled studies, recent well controlled studies suggest that exercise training may be clinically effective, at least in major depression and panic disorder. Although, the evidence for positive effects of exercise and exercise training on depression and anxiety is growing, the clinical use, at least as an adjunct to established treatment approaches like psychotherapy or pharmacotherapy, is still at the beginning. Further studies on the clinical effects of exercise, interaction with standard treatment approaches and details on the optimal type, intensity, frequency and duration may further support the clinical administration in patients. Furthermore, there is a lack of knowledge on how to best deal with depression and anxiety related symptoms which hinder patients to participate and benefit from exercise training.

2.4. Studies Related to Tai Chi Training on Physiological Variables.

Evaluated the effects on blood pressure, lipid profile, and anxiety status on subjects received a 12-week Tai Chi Chuan exercise program (**Jen-Chen Tsai, et al., 2003**). Two (2) selected groups of 76 healthy subjects with blood pressure at high-normal or stage I hypertension. A 12-week Tai Chi Chuan exercise training program was practiced regularly with a frequency of 3 times per week. Each session included 10-minute warm-up, 30-minute Tai Chi exercise, 10-minute cool-down. Exercise intensity was estimated to be approximately 64% of maximal heart rate. Blood pressure, lipid profile and anxiety status (State-Trait Anxiety Inventory; STAI) were evaluated. After 12-weeks of Tai Chi training, the treatment group showed significant decrease in systolic blood pressure of 15.6 mm Hg and diastolic blood pressure 8.8 mm Hg. The serum total cholesterol level decreased 15.2 mg/dL and high-density lipoprotein cholesterol increased

4.7 mg/dL. By using STAI evaluation, both trait anxiety and state anxiety were decreased. This study shows that under well-designed conditions, Tai Chi exercise training could decrease blood pressure and results in favorable lipid profile changes and improve subjects' anxiety status. Therefore, Tai Chi could be used as an alternative modality in treating patients with mild hypertension, with a promising economic effect.

Lee, (2004), determined the effects of a 6-week Tai Chi exercise program on reducing blood pressure for hypertensive patients. A non-equivalent pretest-posttest experimental design was used. Participants were recruited from the Community Health Center in Busan, Korea. Twenty-eight hypertensive patients participated in this study. Among them, fourteen were in the experimental group and the rest are in the control group. Members in the experimental group participated in a 6- week program of Tai Chi exercise. In order to evaluate the effects of the Tai Chi program, blood pressure, total cholesterol, and cortisol level were measured before and after week 6. After the 6-week Tai Chi program, there were significant differences in systolic pressure (t=-3.13, p= .004) and diastolic blood pressure (t=-4.75, p= .000) in the experimental group when compared to the control group. However there were no significant differences in the total cholesterol (t=1.07, p=.294) and cortisol level (F=1.35, p= .256). These results suggest that a 6-week Tai Chi program can be utilized as an effective nursing program to reduce blood pressure for hypertensive patients.

Angosta, et al., (2011), explored current studies on Tai Chi and its impact on coronary heart disease (CHD), (b) provide critique of existing studies, and (c) provide recommendations for clinical practice and future research. Tai Chi is a safe alternative exercise for patients who are at risk of CHD or with existing CHD. Implementing Tai Chi exercise may improve serum lipids, blood pressure, and heart rate.

Adler and Roberts, (2006), studied the Tai Chi is a slow and gentle exercise that is suitable for older adults with chronic illness. This exercise offers the benefits of flexibility, muscle strengthening, and endurance training. Tai Chi has the capability of improving the health of elders without exacerbating existing impairments. Therefore, older adults may be more inclined to participate in and maintain an exercise program.

The purpose of this article is to (1) compare Tai Chi to muscle-strengthening and aerobic exercise, (2) describe possible mechanisms for the effects of Tai Chi on factors that contribute to disability, and (3) identify nursing interventions to promote the use of Tai Chi. Nurse Practitioners (NPs) are in an ideal position to facilitate health promotion and disease prevention. NPs may prescribe Tai Chi as an alternative exercise therapy for their patients who are at risk for developing CHD and even for those with existing CHD. Tai Chi exercise may help prevent and even reverse the progression of cardiac disease.

Sato, et al., (2010), determined whether Tai Chi training in addition to cardiac rehabilitation would result in a shift toward increased vagal activity of autonomic markers, such as baroreflex sensitivity (BRS) and heart rate variability (HRV). Twenty patients with coronary heart disease (CHD) (male/female: 13/7, mean age: 67.8 +/- 4.2 years, mean interval time after a coronary event: 19.8 months) completed this study. The Tai Chi group (n = 10) practiced supervised Tai Chi training once a week and home-based Tai Chi training three times a week together with conventional cardiac rehabilitation for one-year. The control group (n = 10) conducted the conventional cardiac rehabilitation only. BRS and HRV were evaluated at the baseline and after one-year of Tai Chi training. Compared with the controls, patients in the Tai Chi group showed statistically significant improvement in BRS (P = 0.036). These associations persisted after adjustment for age and other covariates. On the other hand, there were no significant trends seen in HRV. Additional Tai Chi training during cardiac rehabilitation may augment reflex vagal regulation, which adds importantly to knowledge of cardiac rehabilitation on autonomic regulation and clinical management of CHD.

Blake and Hawley, (2012), examining the relationship between Tai Chi and physical, neuro cognitive and psychosocial outcomes in older people. This is an emerging and growing area of research and improvements have often been reported in health functioning, physical and emotional health, reducing falls, fear of falling and risk of falls, and possibly enhancing cardiovascular functioning in older adults although the effects on bone density, cognitive and immunological functioning are less clear. Results overall are inconsistent and health improvements have not been evident in all studies. Tai Chi is

becoming increasingly popular in practice, and more recent evidence is emerging which is based on experimental and longitudinal designs, although many of the proposed benefits of Tai Chi are yet to be validated in large, randomized controlled trials.

Tai chi, a type of low-intensity exercise, has received growing attention in both eastern and western cultures, especially its use with the most rapidly increasing segment of the population-elders. Previous research findings further supported the idea that tai chi is appropriate for elderly populations and helps promote their well-being. In this article, the beneficial effects of tai chi for elders are summarized, resources to increase awareness about the exercise are provided, and ways to promote tai chi in elderly populations are suggested (**Chen, et al., 2001**).

Wayne and Kaptchuk, (2008), evaluated the efficacy and safety of t'ai chi as a therapeutic tool for a variety of health conditions, little attention has been devoted to evaluating "how" t'ai chi is scientifically studied, and the advantages or limitations of different methodological approaches. In a companion to this paper (Part I), we argued that t'ai chi is a complex, multi component intervention, which poses unique challenges regarding the distinction of specific versus nonspecific effects and limitations regarding the use of reductionist research frameworks. In this second, companion paper, we discuss additional obstacles inherent in precisely defining the t'ai chi intervention in an experimental paradigm. These challenges include t'ai chi's pluralism, the concept of t'ai chi dosage, and long- versus short-term evaluations of t'ai chi's efficacy and safety. To address these challenges, and with a goal to provide complete and unbiased evidence, we propose a pluralistic methodological approach to clinical research that includes controlled randomized trials of fixed protocols, community-based pragmatic trials, cross-sectional studies of long-term practitioners, and studies that integrate qualitative methods.

Ho TJ, et al., (2007), investigated the effects of TCC on the health-related quality of life (HRQOL) in the senior population. Subjects who regularly practiced TCC in Taiwan were selected by random sampling and included 140 seniors (77 males and 63 females, aged 40-70 years). The questionnaire was separated into 2 parts: demographic information and the SF-36 questionnaire, which used 8 domains to evaluate the subjects'

HRQOL. The results were compared with those of 560 age- and sex-matched control subjects that were taken from the general population (308 males and 252 females). Multiple regression analysis was used to compare the quality of life in each of the 8 domains between the 2 groups. The TCC group showed significantly higher quality-of-life scores than the control group in each of the 8 domains with the exception of the bodily pain scales. Using multiple linear regression adjusted for covariates, the TCC group had significantly higher scores in physical functioning, physical roles, general health, vitality, and social-functioning scales than the control group. In most of the domains in both the TCC group and the control group, quality of life became worse with increased age, whereas the scores in vitality and social-functioning domains of the TCC group showed a reverse trend; they remained unchanged or even improved with increased age. Our study supports the hypothesis that TCC improves quality of life among the elderly in Taiwan, but further study must be conducted to more conclusively show the link between TCC and health-related QOL.

Kressig, et al., (2003), new approaches to health promotion for the growing geriatric population are needed. Low to moderately intense exercise programs, such as T'ai Chi seem particularly appropriate for older individuals because of many worthwhile physiological and psychological long-term benefits. T'ai Chi reduces falls and improves postural stability in older adults. It also has a positive impact on muscle strength and cardiovascular fitness and can improve mobility in patients with rheumatoid arthritis. It imparts a sense of well-being and confidence, and can reduce fear of falling in older adults. This article reviews the current medical literature regarding the multiple effects of T'ai Chi. Historical aspects of T'ai Chi and its current adaptation for practice by healthy older adults are presented. Finally, a set of modified exercises is proposed that is based on underlying principles of T'ai Chi and can be applied to patients with mild to moderate cognitive impairment.

Kunter, eta l., (1997), older persons who are willing to begin exercise programs are often not willing to continue them. At the Atlanta FICSIT (Frailty and Injuries: Cooperative Studies of Intervention Techniques) site, individuals aged 70+ were

randomized to Tai Chi (TC), individualized balance training (BT), and exercise control education (ED) groups for 15 weeks. In a follow-up assessment 4 months post-intervention, 130 subjects responded to exit interview questions asking about perceived benefits of participation. Both TC and BT subjects reported increased confidence in balance and movement, but only TC subjects reported that their daily activities and their overall life had been affected; many of these subjects had changed their normal physical activity to incorporate ongoing TC practice. The data suggest that when mental as well as physical control is perceived to be enhanced, with a generalized sense of improvement in overall well-being, older persons' motivation to continue exercising also increases.

Yeh GY, et al., (2010), determined the feasibility of a randomized controlled trial of the effect of a tai chi program on quality of life and exercise capacity in patients with COPD. We randomized 10 patients with moderate to severe COPD to 12 weeks of tai chi plus usual care (n = 5) or usual care alone (n = 5). The tai chi training consisted of a 1-hour class, twice weekly, that emphasized gentle movement, relaxation, meditation, and breathing techniques. Exploratory outcomes included disease-specific symptoms and quality-of-life, exercise capacity, pulmonary function tests, mood, and self-efficacy. We also conducted qualitative interviews to capture patient narratives regarding their experience with tai chi. The patients were willing to be randomized. Among 4 of the 5 patients in the intervention group, adherence to the study protocol was excellent. The cohort's baseline mean ± SD age, percent-of-predicted FEV_1, and ratio of FEV_1 to forced vital capacity were 66 ± 6 y, 50 ± 12%, and 0.63 ± 0.14, respectively. At 12 weeks there was significant improvement in Chronic Respiratory Questionnaire score among the tai chi participants (1.4 ± 1.1), compared to the usual-care group (-0.1 ± 0.4) (P = .03). There were non-significant trends toward improvement in 6-min walk distance (55 ± 47 vs -13 ± 64 m, P = .09), Center for Epidemiologic Studies Depression Scale (-9.0 ± 9.1 vs -2.8 ± 4.3, P = .20), and University of California, San Diego Shortness of Breath score (-7.8 ± 3.5 vs -1.2 ± 11, P = .40). There were no significant changes in either group's peak oxygen uptake. A randomized controlled trial of tai chi is feasible in patients with moderate to severe COPD. Tai chi exercise as an adjunct to standard care warrants further investigation.

Lan, et al., (2004), studied the thirty-six community-dwelling men with a mean age of 59 years participated in this study. Each group (Qigong, TCC and control) included 12 subjects with matched age and body size. The Qigong group practiced Qigong regularly for 2 years and the Tai Chi group practiced Tai Chi for 5 years. Heart rate (HR) responses were measured during the practice of Qigong and Tai Chi. Additionally, breath-by-breath measurement of cardio-respiratory function was performed during the incremental exercise of leg cycling. The mean HR during Qigong and Tai Chi practice was 91 and 129, respectively. At the peak exercise and the ventilatory threshold (VeT), the Tai Chi group displayed the highest oxygen uptake (VO2), O2 pulse and work rate among the three groups. The Qigong group also showed higher oxygen uptake and O2 pulse than the control group. At the same relative exercise intensity, the Qigong group had the highest tidal volume among the three groups. In conclusion, Qigong and Tai Chi show a beneficial effect aerobic capacity in older individuals, but Tai Chi displays a better training effect than Qigong due to its higher exercise intensity. However, Qigong can enhance breathing efficiency during exercise due to the training effect of diaphragmatic breathing.

Taylor-Piliae, and Froelicher, (2004), examined tai Chi exercise in improving aerobic capacity: a meta-analysis computerized search of 7 databases was done. Aerobic capacity was expressed as peak oxygen uptake (VO2peak). Of 441 citations obtained, only 7 focused on aerobic capacity in response to Tai Chi exercise. Aerobic capacity was higher in subjects performing classical Yang style (108 postures) Tai Chi, a 52-week Tai Chi exercise intervention, compared with sedentary subjects.

Hui, et al., (2009), A 12-week Tai Chi or walking exercise intervention produced significant and similar beneficial effects on body composition, aerobic fitness, muscular fitness, fasting blood glucose, resting metabolic rate, and perceived health in middle-aged. While Tai Chi and walking both elicited significant cardio respiratory responses and energy expenditure to the moderate intensity level, walking exercise elicited about 46% higher metabolic cost than Tai Chi exercise.

2.5. Studies Related to Tai Chi Training on Bio-chemical Variables.

Thomas, et al., (2005), performed to assess its impact on cardiovascular risk factors in comparison with resistance training exercises in elderly Chinese subjects. A total of 207 healthy elderly participants (65-74 years, 113/207 (55%) men) were randomly assigned to one of three intervention groups: (1) Tai Chi, three times/week for 1 h/session (n = 64); (2) resistance training exercise, three times/week for 1 h/session (n = 65); (3) usual level of physical activity control group (n = 78). Anthropometric measures, dual X-ray densitometry body composition, blood pressure, lipids, glycaemic and insulin sensitivity indices were measured at baseline and 12 months. Repeated-measures analysis of variance (anova) was used to assess the between-group changes using a last-observation-carried-forward intention-to-treat approach. A total of 180 (87.0%) subjects completed the study. No significant changes were identified in the Tai Chi group compared to the resistance training or control group. Of the primary outcomes, only the improvement in the insulin sensitivity index differed, being significantly greater in the resistance training than in the control group [mean difference 0.018 (95% confidence interval (CI) 0.000-0.037) mmol glucose/min, P = 0.02), and tending to be greater than in the Tai Chi group (mean difference 0.019 (95% CI 0.000-0.038) mmol glucose/min, P < 0.06). Tai Chi had no significant effect on any measure compared to the controls, whereas resistance training improved the insulin sensitivity index in this 12-month study.

Wan-An Lu and Chenf-Deng Kuo, (Sep,2012), investigated the effect of 3 months of Tai Chi Chuan (TCC) training on heart rate variability, blood lipids and cytokine production in elderly people. This was a longitudinal study with 3 months of follow-up. Participants were recruited from the community and divided randomly into two groups. The TCC trainees exercised the classical Yang's TCC for 40 minutes/session, seven times/week over a course of 3 months. Twenty-five TCC trainees (median age = 57.0 years, range = 50.0–67.0 years) and 25 control individuals (median age = 53.0 years, range = 46.5–58.5 years) were included in this study. TCC training for 3 months significantly increased the fasting blood sugar ($p < 0.001$), ratio of forced expiratory volume in the first second to the forced vital capacity (FEV1/FVC) ($p < 0.05$), high-

density lipoprotein-cholesterol (HDL-C) ($p < 0.05$), tumor necrosis factor-α (TNF-α) ($p < 0.001$), and interferon-γ (IFN-γ) ($p < 0.001$) in the TCC trainees. In contrast, the total cholesterol (TC) and the ratio of TC to HDL-C (TC/HDL-C) of the TCC trainees were all significantly decreased after 3 months of TCC training ($p < 0.001$). However, all heart rate variability (HRV) measures were not significantly changed after 3 months of TCC. Three months of TCC training can improve the pulmonary function, glucose availability and blood lipid profile, as well as increase the cytokine production, in middle-aged and elderly individuals. TCC may be beneficial to middle-aged and elderly people as a health-promoting calisthenics.

(Sep, 2012), "The Effects of Tai-chi Softball on the Blood Lipid and Physiological Function of the Middle-Aged Women", **http://www.s-paper.com/32073/index.html.** studied the effect of playing Tai-chi softball on middle-aged women lipids and physiological indicators. This paper enlisted 29 middle-aged women volunteers as an object of study, with normal cardiopulmonary ability and without disability who are not diseased seriously and don't often participate in sports exercise. They were divided into two groups: 46-55y and 56-65y. Subjects practiced Tai-chi softball following the specially-assigned person in the morning and 40~50minutes a day, above 5 days a week, for 3 mouths. Then serum triglyceride(TG), total cholesterol(TC), low-density lipoprotein cholesterol(LDL-C) and high-density lipoprotein cholesterol(HDL-C) blood lipid indicators, and heart rate, blood pressure, vital capacity, the grip force etc some physiological indicators above were assayed before and after the training.Results:1) After Tai-chi softball training, 46-55y and 56-65y subjects serum TG and TC were very significantly decreased ($P<0.01$); HDL-C increased ($P<0.01$); the 46-55y group, LDL-C showed significance decreased ($P<0.05$), while 56-65y group, LDL-C decreased ($P<0.01$).2) After Tai-chi softball training, 46-55y group, subjects in a quiet pre-exercise heart rate decreased more ($P<0.05$), while the 56-65y group, subjects and exercise earlier there was a significant difference ($P<0.01$). Two subjects groups, systolic blood pressure, diastolic blood pressure in comparison with the previous exercise was significantly lower ($P<0.01$); vital capacity in comparison with the previous exercise very significance increase ($P<0.01$). 3) After Tai-chi softball training,

the grip force and back edge, 46-55y and 56-65y groups, subjects in the 56-65y group, only the right-hand grip and back strength increased (P<0.05). Compared with 3 months ago, 46-55y and 56-65y groups, subjects movement and reaction time when the very significant decrease (P<0.01). Acoustic response of the two groups compared with the previous exercise significant difference (P<0.05), while the two light reaction time and exercise earlier there was a significant difference (P<0.01). Health station bent and stork stand, more than before exercise very significant increase (P<0.01).This study showed that Tai-chi softball may effectively reduce TG, TC, LDL-C, raise HDL-C, to improve the situation of middle-aged women blood lipid; to reduce heart rate, blood pressure, enhance vital capacity; It would have a certain role to raise the strength of middle-aged women force, agility, flexibility and other physical fitness. Tai-chi softball is a favorable fitness item.

2.6. Studies Related to Tai Chi Training on Psychological Variables.

Wang, et al., (2004), conducted a systematic review of reports on the physical and psychological effects of Tai Chi on various chronic medical conditions. Data were extracted for the study objective, population characteristics, study setting, type of Tai Chi intervention, study design, outcome assessment, duration of follow-up, and key results. There were 9 randomized controlled trials, 23 nonrandomized controlled studies, and 15 observational studies in this review. Benefits were reported in balance and strength, cardiovascular and respiratory function, flexibility, immune system, symptoms of arthritis, muscular strength, and psychological effects. Tai Chi appears to have physiological and psychosocial benefits and also appears to be safe and effective in promoting balance control, flexibility, and cardiovascular fitness in older patients with chronic conditions. However, limitations or biases exist in most studies, and it is difficult to draw firm conclusions about the benefits reported. Most indications in which Tai Chi was applied lack a theoretical foundation concerning the mechanism of benefit. Well-designed studies are needed.

Taylor-Piliae, et al., (2006), examined change in psychosocial status following a 12-week Tai Chi exercise intervention among ethnic Chinese people with

cardiovascular disease risk factors living in the United States of America. Regular participation in physical activity is associated with protection against cardioavascular disease, and improvements in physical and psychological health. Increasing amounts of scientific evidence suggests that mind-body exercise, such as Tai Chi, are related to improvements in mental health, emotional well-being, and stress reduction. No prior study has examined the effect of a Tai Chi exercise intervention on psychosocial status among people with cardiovascular disease risk factors. This was a quasi-experimental study. Participants attended a 60-minute Tai Chi exercise class three times per week for 12 weeks. Data were collected at baseline, 6 and 12 weeks following the intervention. Psychosocial status was assessed using Chinese versions of Cohen's Perceived Stress Scale, Profile of Mood States, Multidimensional Scale of Perceived Social Support, and Tai Chi exercise self-efficacy. A total of 39 participants, on average 66-year-old (+/-8.3), married (85%), Cantonese-speaking (97%), immigrants participated. The majority were women (69%), with < or =12 years education (87%). Statistically significant improvements in all measures of psychosocial status were found (P < or = 0.05) following the intervention. Improvement in mood state (eta2 = 0.12), and reduction in perceived stress (eta2 = 0.13) were found. In addition, Tai Chi exercise statistically significantly increased self-efficacy to overcome barriers to Tai Chi (eta2 = 0.19), confidence to perform Tai Chi (eta2 = 0.27), and perceived social support (eta2 = 0.12). Tai Chi was a culturally appropriate mind-body exercise for these older adults, with statistically significant psychosocial benefits observed over 12-weeks. Further research examining Tai Chi exercise using a randomized clinical trial design with an attention-control group may reduce potential confounding effects, while exploring potential mechanisms underlying the relaxation response associated with mind-body exercise. In addition, future studies with people with other chronic illnesses in all ethnic groups are recommended to determine if similar benefits can be achieved.

Ko GT, et al., (2006), Physical activity is associated with a better longevity and reduced morbidity. In addition, exercise has a mood-elevating effect, which improves self-esteem. Tai-Chi is a traditional Chinese aerobic exercise. We aimed to assess the short-term effects of Tai-Chi on the clinical parameters and health-related quality of life

(QOL) in Hong Kong Chinese. Twenty Chinese healthy female subjects were recruited. There were 2 Tai-Chi sessions per week for 10 weeks. Each session lasted for one hour. Health-related QOL was assessed with SF-36 questionnaire. Of the 20 subjects, their mean age was 40.8 +/- 5.9 years (median 42.5 years, range 30-50 years). At the end of the study, systolic blood pressure, total cholesterol and low-density lipoprotein cholesterol levels significantly reduced (114 +/- 9 to 108 +/- 9 mmHg, p = 0.012; 4.7 +/- 0.8 to 4.4 +/- 0.5 mmol/L, p = 0.020 and 2.7 +/- 0.6 to 2.2 +/- 0.5 mmol/L, p = 0.001, respectively). Among all SF-36 items, Vitality and Mental Health significantly improved after the 10-week Tai-Chi program (64.9 +/- 8.1 to 68.4 +/- 6.6, p = 0.038 and 64.4 +/- 6.9 to 69.1 +/- 1.4, p = 0.003, respectively). A 10-week Tai-Chi exercise program improved systolic blood pressure, lipid profiles and some of the parameters of health-related QOL in Hong Kong Chinese women. Tai-Chi is likely to be a useful choice of physical activity. We need a larger study that covers a wider range of populations to confirm our results.

Kuramota, (2006), the majority of studies on Tai Chi conducted between 1996 and 2004 had focused on health and well being of Tai Chi exercise for senior adults. The results show that Tai Chi may lead to improved balance, reduced fear of falling, increased strength, increased functional mobility, greater flexibility, and increased psychological well-being, sleep enhancement for sleep disturbed elderly individuals, and increased cardio functioning. Wang, Collet, and Lau did a systematic review on Tai Chi research and found some limitations or biases' existing in some of the studies, and it was difficult to draw firm conclusions about the benefits reported. Therefore, more well-designed studies are needed in the future. There need to be studies on the effects on younger and middle-aged people. More longitudinal studies are needed, since time is an important factor of physical and psychological interventions. Studies on the effects of Tai Chi on the immune system and bone loss reduction are still very exploratory and will be especially useful for arthritis patients and others with immune disorders. Future studies should investigate outcomes associated with Tai Chi training as a function of different instructional techniques, different Tai Chi styles, different diagnostic groups, and different age groups. It is not yet clear which of the components in Tai Chi makes the exercise form especially effective for seniors. Tai Chi exercise is a relatively "low tech"

approach to preventing disability and maintaining physical performance in older adults. The positive effects of Tai Chi may be due solely to its relaxing, meditative aspects. The current data suggest that Tai Chi can influence older individuals' functioning and well being and provide some appreciation for why this exercise form has been practiced by older Chinese for more than 3 centuries.

Wang, et al., (2010), examined the effects of Tai Chi on stress, anxiety, depression and mood disturbance in eastern and western populations. Eight English and 3 Chinese databases were searched through March 2009. Randomized controlled trials, non-randomized controlled studies and observational studies reporting at least 1 psychological health outcome were examined. Data were extracted and verified by 2 reviewers. The randomized trials in each subcategory of health outcomes were meta-analyzed using a random-effects model. The quality of each study was assessed. Forty studies totaling 3817 subjects were identified. Approximately 29 psychological measurements were assessed. Twenty-one of 33 randomized and nonrandomized trials reported that 1 hour to 1 year of regular Tai Chi significantly increased psychological well-being including reduction of stress (effect size [ES], 0.66; 95% confidence interval [CI], 0.23 to 1.09), anxiety (ES, 0.66; 95% CI, 0.29 to 1.03), and depression (ES, 0.56; 95% CI, 0.31 to 0.80), and enhanced mood (ES, 0.45; 95% CI, 0.20 to 0.69) in community-dwelling healthy participants and in patients with chronic conditions. Seven observational studies with relatively large sample sizes reinforced the beneficial association between Tai Chi practice and psychological health. Tai Chi appears to be associated with improvements in psychological well-being including reduced stress, anxiety, depression and mood disturbance, and increased self-esteem. Definitive conclusions were limited due to variation in designs, comparisons, heterogeneous outcomes and inadequate controls. High-quality, well-controlled, longer randomized trials are needed to better inform clinical decisions.

Brown, et al., (1989), studied the T'ai Chi chuan (TCC) is a widely practiced Chinese martial art said to physically develop balance and coordination as well as enhance emotional and mental health. TCC consists of a series of postures combined into

a sequential movement providing a smooth, continuous, low-intensity activity. The purpose of this study was to examine the ventilatory and cardiovascular responses to the Long Form of Yang's style TCC. In addition, the subjects' TCC responses were compared to their ventilatory and cardiovascular responses during cycle ergometry at oxygen consumption (VO2) equivalent to the mean TCC V02. Six experienced (M = 8.3 yrs) male TCC practitioners served as subjects with data collected during the Cloud H and movement of the TCC exercis-e. Significantly (p less than .05) lower responses for ventilatory frequency (Vf) (11.3 and 15.7 breaths.min-1), ventilatory equivalent (VE/VO2) (23.47 and 27.41), and the ratio of dead space ventilation to tidal volume (VD/VT) (20 and 270c) were found in TCC in comparison to cycle ergometry. The percentage of minute ventilation used for alveolar ventilation was significantly higher during TCC (p less than .03) than cycle ergometry, with mean values of 81.lt and 73.lt respectively. Cardiac output, stroke volume, and heart rate were not significantly different between TCC exercise and cycle ergometry at the same oxygen consumption. We concluded -that, during TCC, expert practitioners show significantly different ventilatory-responses leading to more efficient use of the ventilatory'volume than would be expected from comparable levels of exertion on a cycle ergometer.

Jin, (1989), assessed for 33 beginners and 33 practitioners. The variables in the three-way factorial design were experience (beginners vs practitioners) , time (morning vs afternoon vs evening), and phase (before Tai Chi vs during Tai Chi vs after Tai Chi) . Phase was a repeated measures variable. Relative to measures taken beforehand, practice of Tai Chi raised heart rate, increased noradrenaline-excretion in urine, and decreased salivary cortisol concentration. Relative to baseline levels, subjects reported less tensioh, depression, anger, fatigue, confusion and state-anxiety, they felt more vigorous, and in -general they had less total mood disturbance. The data suggest that Tai Chi results in gains that are comparable to those found with moderate exercise. There is need for research concerned with whether participation in Tai Chi has effects over and above those associated with physical exercise.

Barlow and Coren, (2001), addressed to whether group-based parenting programmes are effective in improving maternal psychosocial health including anxiety, depression, and self-esteem. A range of biomedical, social science, educational and general reference electronic databases were searched including MEDLINE, EMBASE CINAHL, PsychLIT, ERIC, ASSIA, Sociofile and the Social Science Citation Index. Other sources of information included the Cochrane Library (SPECTR, CENTRAL), and the National Research Register (NRR). Only randomized controlled trials were included in which participants had been randomly allocated to an experimental and a control group, the latter being a waiting-list, no-treatment or a placebo control group. Studies had to include at least one group-based parenting programme, and one standardized instrument measuring maternal psychosocial health. A systematic critical appraisal of all included studies was undertaken using a modified version of the Journal of the American Medical Association (JAMA) published criteria. The treatment effect for each outcome in each study was standardized by dividing the mean difference in post-intervention scores for the intervention and treatment group, by the pooled standard deviation, to produce an effect size. Where appropriate the results were then combined in a meta-analysis using a fixed-effect model, and 95% confidence intervals were used to assess the significance of the findings. A total of 23 studies were included in the review but only 17 provided sufficient data to calculate effect sizes. The 17 studies provided a total of 59 assessments of outcome on a range of aspects of psychosocial functioning including depression, anxiety, stress, self-esteem, social competence, social support, guilt, mood, automatic thoughts, dyadic adjustment, psychiatric morbidity, irrationality, anger and aggression, mood, attitude, personality, and beliefs. There was only sufficient data, however, on five outcomes (depression; anxiety/stress; self-esteem; social support; and relationship with spouse/marital adjustment) to combine the results in a meta-analysis. The meta-analyses show statistically significant results favouring the intervention group as regards depression; anxiety/stress; self-esteem; and relationship with spouse/marital adjustment. The meta-analysis of the social support data, however, showed no evidence of effectiveness. These results suggest that parenting programmes, irrespective of the type (or content) of programme, can be effective in improving important aspects of maternal

psycho-social functioning. Of the data summarizing the effectiveness of the different types of parenting programmes, which it was not possible to combine in a meta-analysis, approximately 22% of the outcomes measured, showed significant differences between the intervention group and the control group. A further 40% showed medium to large non-significant differences favouring the intervention group. Approximately one-third of outcomes showed small non-significant differences or no evidence of effectiveness. A meta-analysis of the follow-up data on three outcomes was also conducted - depression, self-esteem and relationship with spouse/marital adjustment. The results show that there was a continued improvement in self-esteem, depression and marital adjustment at follow-up, although the latter two findings were not statistically significant. It is suggested that parenting programmes can make a significant contribution to short-term psychosocial health in mothers, and that the limited follow-up data available suggest that these are maintained over time. However, the overall paucity of long-term follow-up data points to the need for further evidence concerning the long-term effectiveness of parenting programmes on maternal mental health. Furthermore, it is suggested that some caution should be exercised before the results are generalised to parents irrespective of the level of pathology present, and that further research is still required.

Wei Chun Wang, et al., (2008), aimed to critically appraise published clinical trials designed to assess the effect of Tai Chi on psychosocial well-being. Methodological quality was assessed using a modified Jadad scale. A total of 15 studies met the inclusion criteria (i.e. English publications of randomized controlled trials with Tai Chi as an intervention and psychological well-being as an outcome measure), of which eight were high quality trials. The psychosocial outcomes measured included anxiety (eight studies), depression (eight studies), mood (four studies), stress (two studies), general mental health three studies), anger, positive and negative effect, self-esteem, life satisfaction, social interaction and self-rated health (one study each). Tai Chi intervention was found to have a significant effect in 13 studies, especially in the management of depression and anxiety. Although the results seemed to suggest Tai Chi is effective, they should be interpreted cautiously as the quality of the trials varied substantially. Furthermore, significant findings were shown in only six high quality

studies. Moreover, significant between group differences after Tai Chi intervention was demonstrated in only one high quality study (the other three significant results were observed in non-high quality studies). Two high quality studies in fact found no significant Tai Chi effects. It is still premature to make any conclusive remarks on the effect of Tai Chi on psychosocial well-being.

Zhang, et al., (2012), as a popular exercise form, Tai Chi (TC) has been investigated to determine its contributions to an active and healthy lifestyle. There are an increasing number of researchers who focus on exploring the potential physiological and psychological benefits of TC but only a few systematic reviews of these benefits to a variety of populations. The purpose of this paper is to comprehensively evaluate the reported psychological benefits associated with practicing TC. Although many investigators have reported possible psychological benefits of TC for children, young adults, older healthy adults, and for a variety of patient populations, many of the reports suffer one or more methodological flaws. These flaws include inadequate study design, including lack of control groups, small sample sizes, unsophisticated statistical techniques, or publication without rigorous peer review. After reviewing the results of the existing literature regarding the potential psychological benefits of TC, we recommend that future investigations be conducted with additional adherence to the traditional scientific process.

2. 7. Studies Related to Yogic Practices and Football Players

Acharya., et al., (2010), Studied the effect of pranayama (voluntary regulated breathing) and yogasana (yoga postures) on lipid profile in normal healthy junior footballers. Twenty male junior footballers younger than 15 years of age, belonging to the Mohun Bagan Athletic Club, Kolkata, were selected for the study at Haridwar. They had to play in a Football Cup organized in UK and they were here to practice yoga sequences taught by Swami Ramdevji. They were of age 14.65±0.58 years and none of them had a history of lipid metabolism disorders. There was a significant reduction in the levels of serum cholesterol, Low-density lipoprotein (LDL) cholesterol, serum triglycerides, and very-low-density lipoprotein (VLDL)-cholesterol at the end of the yoga

session. The results indicated that the fasting blood sugar (FBS) level was positively elevated in junior footballers. This demonstrated that Pranayama and Yogasana were helpful in regulating sugar level also. Study demonstrates the efficacy of SRY (Swami Ramdev Yoga)- Pranayama and Yogasana sequences on blood lipid profiles in normal healthy footballers. Pranayama and Yogasana can be used as supportive therapy in patients with lipid disorders, heart diseases, hypoglycemia, and so on. There is a need for conducting the experiments on a larger number of participants, to explore the results and mode of action.

Rajakumar, (2010), analyze the impact of yogic practices and physical exercises on selected physiological variables among the intercollegiate soccer players. To achieve this purpose, sixty (60) male intercollegiate soccer players from the various colleges; Chennai were selected at random. Their age ranged between17 to 22. The selected subjects were divided into three equal groups of 20 each, namely yogic practice group (Group A), physical exercises group (Group B) and control group (Group C). The experimental groups have underwent 12 weeks of training namely; yogic practices and physical exercises respectively, whereas the control group (Group C) maintained their daily routine activities and no special training was given. The subjects of the three groups were tested using standardized tests and procedures on selected physiological variables before and after the training period to find out the training efforts in the following test items: Resting pulse rate through stethoscope, Breath holding time through digital stop watch, Peak flow rate through Wright's peak flow meter. The collected data were analyzed statistically through Analysis of Co-variance (ANACOVA) and Schiff's post hoc test to find out the pre and post training performances, compare the significant difference between the adjusted final means and the better group. The yogic practice group showed significant improvement due to 12 weeks training on resting pulse rate, breath holding time and peak flow rate compared to the physical exercise and control group. In the overall training effects in terms of improved number of physiological variables and their magnitude of improvement through training, yogic practice group is found to be the better group when compared to the other two groups.

2.8 Studies Related to Yogic Practices and Tai chi training on Selected Variables

In 2011, **Field, et al.,** examined the Tai chi/yoga effects on anxiety, heart rate, EEG and math computations. For that 38 adults participated in a 20-min Tai chi/yoga class. The session was comprised of standing Tai chi movements, balancing poses and a short Tai chi form and 10 min of standing, sitting and lying down yoga poses. Main outcome measures are the pre and post Tai chi/yoga effects were assessed using the State Anxiety Inventory (STAI), EKG, EEG and math computations. The result showed that Heart rate increased during the session, as would be expected for this moderate-intensity exercise. Changes from pre to post-session assessments suggested increased relaxation including decreased anxiety and a trend for increased EEG theta activity. And they concluded the increased relaxation may have contributed to the increased speed and accuracy noted on math computations following the Tai chi/yoga class.

2.9. Summary of the Literature

The reviews are presented under the seven sections. All the research studies that are presented in this section prove that yogic practice methods and tai-chi training contribute significantly for better improvement in selected criterion variables.

Research studies using yogic practice revealed compatible results (**Telles, et al., (2011, Rajakumar, 2010, Acharya., et al., 2010, Field, et al., 2011 and Hale, et al., 2002**). There was clear evidence that the use of yogic practice was one of the effective training methods to improve the selected criterion variables among the obese adolescents.

The independent and dependent variable for the current study are tai-chi training and the change of level of selected variables **Chenchen Wang et al., 2010**, **Jen-Chen Tsai, et al., 2003, Wan-An Lu, 2012, Yeh GY et al., 2010** and **Sato S, et al., 2010**.

The review of literature helped the researcher from the methodological point of view too. It was learnt that most of the research studies cited in this chapter on analysis and experimental design as the appropriate methods for finding out the training. The present study may serve as a foundation and main ingredient for future research and investigation in training methods for changing the physiological, bio-chemical, psychological and playing abilities of women football players.

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