

Chapter II

REVIEW OF RELATED LITERATURE

The present chapter consists of various research studies relevant to the study under investigation. A search for the reference materials would assist the investigator to determine the effectiveness of the various combinations of the variables, methodology used and the results obtained. Study of the Related Literature comprises loading, reading and evaluating reports of research as well as reports of casual observation and opinion that are related to the individuals planned research report. A study of relevant Literature is an essential step to get a full picture of what has been done with regard to the problem under study. The investigator has made an attempt to bring a brief review of research related to the present study to form the background for the present study.

Bernadi L., and team., 2001, conducted a comparative study to test whether yoga mantras can synchronize and reinforce cardiovascular rhythms and modify baroreflex sensitivity. Baroreflex sensitivity is a measure of how good the body is at maintaining normal blood pressure. The study was small, including only 23 healthy adults. The main outcome measures of this study included breathing rate, regularity of breathing, baro reflex sensitivity, and frequency of cardiovascular oscillations (heart rate variability). Results showed that recitation of the yoga mantras slowed down respiration to almost precisely 6 breaths per minute. The measured effects showed improvement in heart rate variability and baro reflex sensitivity with statistical significance. Reduced hear rate variability and baro

reflex sensitivity are independent predictors of heart disease (Bernadi, et.al., 2001).

Chaya M., Kurpad A., Nagendra H., Nagarathna R., 2006, studied the effects of long term yoga practice on the basal metabolic rate of healthy adults. Basal metabolic rate is the measure of energy expenditure after a 12 hours fasting period. One hundred and four subjects were included in the study of 39 women and 65 men ranging from 20-60 years of age. These subjects were performing a combination of asanas, pranayamas, and meditation for the past six months or more. When compared to the non yoga control group the long term yoga practice subjects had significantly lower basal metabolic rate. Although the exact mechanism to account for this change is not certain, one explanation is that there was a decrease in sympathetic nervous system activity as a result of the yoga practices. This suggests a normalization of autonomic nervous system function from long term yoga use.

Vanoni de Godoy., Bringhenti R., Severa A., Gasperi R., Poli L., 2006, conducted a study to measure the effect of yoga and aerobic activity on spirometry and maximal inspiratory pressure. Spirometry is a measure of lung function by measuring inspiratory and expiratory lung volumes, while maximal inspiratory pressure is a lung test to measure the power of inspiratory muscles. The study consisted of 31 healthy volunteers. Fifteen volunteers were placed in a group that performed aerobic exercise for 45-60 minutes, twice a week for three months. The results of the study showed that neither aerobic exercise nor yoga practice produced significant changes in spirometric indices or maximal inspiratory

pressure. This clearly explains that yoga protects the health of the healthy and cures the disease of the disease.

Further, general effects of yoga were studied by **Pansare M., Kulkarni A., Pendse U., 1989**. This study measured lactate dehydrogenase (LDH) in yoga trained individuals before and after yogic training regime. LDH is a glycolic enzyme used to convert lactate to pyruvate to produce ATP. It is a measure of the body's ability to metabolize lactate build up in the tissue and to convert that into energy. Therefore, it is a significant measure of anaerobic capacity. Fourteen females and six male students with an average age of 18 years were in yoga training for six weeks. All males and females showed a statistically significant increase in LDH levels following six week yoga training regime. Yoga is usually considered to be a soothing, relaxing, mildly aerobic activity, rather than a practice that can benefit anaerobic capacity. This study included only 20 subjects, so larger studies are required.

Haggins M., Moore W., Rundle A, 2007, conducted a study to determine whether or not hatha yoga meets recommended standards for physical activities to maintain health and cardiovascular fitness. Twenty intermediate to advanced level yoga practitioners went through an exercise regime while inside an indirect calorimeter (human respiratory chamber). The exercise regime included thirty minutes of sitting, fifty-six minutes of beginning level hatha yoga and ten minutes of walking on a treadmill at 3.2 and 4.8 kph each. Mean subject age was 31.4 +/- 8.3 years. Oxygen consumption (VO₂), heart rate, percentage predicted maximal heart rate, metabolic equivalents, and energy expenditure were the outcome is

measurable. Seven subjects repeated the session for measurement reliability. Metabolic equivalent is a ratio of basal metabolic rate and working metabolic rate and is a measurement for the rate at which calories are burnt. The hatha yoga performed in this study did not meet the recommended activity levels as defined by the American College of Sports Medicine and the American Heart Association. It is suggested however, that a hatha yoga session including atleast ten minutes of sun salutations may contribute a portion of recommended exercise intensity for achieving cardiovascular fitness. As yoga grows into the exercise routine of healthy Americans, it is important that yoga designed sessions meet the established exercise demand standards to maintain cardiovascular health.

Innes K., Vincent H., Taylor A., 2007, conducted a literature review on the role of yoga in treating chronic stress and insulin resistance. The study, conducted in the University of Virginia Health Systems, reviewed 166 sources. The conclusion was that yoga may offer promise in primary and secondary prevention of insulin resistance syndrome and cardiovascular disease. The evidence reviewed suggests that yoga can improve mood, well being, reduce sympathetic activity and improve cardiovagal function. This is important information because it suggests that yoga may not only be a mechanism of exercise for individuals, but can function as a primary and secondary treatment method for diagnosed disease and disease processes. With a worldwide increase in metabolic syndromes and cardiovascular diseases, yoga may have global implications for the successful treatment and prevention of these life threatening diseases (Innes et. al., 2007).

Smith C., Hancock H., Blake-Mortimer J., Eckert K., 2007, performed a study to determine if yoga and relaxation reduce stress and anxiety. Results of this study showed that after a ten week intervention of one hour per week sessions that yoga was as effective as relaxation in reducing stress, anxiety, and improving mental health status. Yoga performed better than relaxation in improving mental health according to the following outcome measures. The outcome measures for this study were the State Trait Personality Inventory, a General Health Questionnaire, and the short form – 36. Stress and anxiety contribute to many disease processes including cardiovascular disease and mental illness (Smith et. al., 2007). This study points out that yoga and relaxation separately decrease stress and anxiety and yoga can be appropriate tool to prevent stress and anxiety.

Okien B., Zajdel D., Kishiyama S., Flegal K., Dehen C., Haas M., Kraemer D., Lawrence J., Leyva J., 2006, conducted a study to learn the effects of yoga on cognition and quality of life in a group of healthy seniors. One hundred and eighteen healthy male and female seniors completed the six month intervention. The age range of the subjects varied from 65-85 years and the subjects were divided into a yoga group, an exercise group, and a wait-list control group. This trial did not demonstrate an increase in cognitive function in the elderly population while doing yoga. There were statistically significant quality-of-life improvements seen in the yoga group that were not seen in the exercise group. The ability of the subjects to maintain one-legged standing and seated forward bending postures was statistically improved in the yoga group. These physical improvements may prove valuable in the maintenance of balance and

prevention of falls in the elderly. Immobilization is often the beginning of a sequence towards death as an immobilized geriatric patient becomes increasingly susceptible to infections.

Additional research investigating the geriatric population on the effects of yoga on gait in the elderly was conducted by **DiBenedetto M., Innes K., Taylor A., Rodeheaver P., Boxer J., Wright J., Kerrigan C., 2005**. The study measured hip extension range, stride length, and indices of gait function in the elderly and if they were affected by yoga intervention. These motions can be greatly diminished in the elderly and have been strongly correlated with a risk for recurrent falls, dependency, and mortality among geriatric populations. This study included 23 healthy adults from age 62-83 who were not yoga practitioners and 19 participants completed the intervention. After and eight week Iyengar Hatha yoga program of two ninety-minute yoga sessions per week, the results showed a statistically significant improvement in hip extension and stride length. Iyengar hatha yoga focuses on precise positioning of the body during postures and many times includes the use of blocks and belts to support the practitioner. There was also a noticeable trend toward improvement of anterior pelvic tilt, which is an indicator of pelvic muscle imbalance. This suggests that a regular yoga routine could play an important role in maintenance of balance and fall prevention among elderly.

Cooper S., Osborne J., Newton S., Harrison V., Thompson-Coon J., Lewis S., Tattersfield A., 2003, conducted research on machine-based breathing exercise routines. One group used a breathing apparatus to simulate the Buteyko breathing technique, another used the Pink City Lung Exerciser (PCLE), and the

third group used a PCLE placebo machine. The PCLE machine is designed to mimic pranayama breathing. Buteyko breathing technique is used as a complementary therapy for asthmatics. Sixty-nine patients ranging from 18-70 years of age completed the study, which included a 6 month breathing regimen. All subjects had been diagnosed with stable asthma with no other important illnesses. The only measured change in the groups was a decrease in bronchodilator (asthma medication) use in the Buteyko group. Further study is warranted to determine what more we can learn about breathing exercises as complementary treatment for asthmatic patients.

Sareen S., Kumari V., Gajebasia KS., Gajebasia KG., 2006, published a study on how yoga could improve the quality of life in chronic pancreatitis patients. 52 patients completed the study and half of those subjects were placed into the yoga group. The control group continued their usual care as directed by their physicians. The yoga group received biweekly yoga routines for 12 weeks. Statistically significant improvements were seen in quality of life, symptoms of stress, mood, alcohol dependence, and appetite.

Cohen and Townsend, 2007, published a short literature review on yoga and hypertension. In one study they cited, the yoga group had average systolic blood pressure decrease of 33 mgHg. The yoga group performed 6 one-hour sessions of yoga per week for 11 weeks. Over the same time period, the yoga group outperformed the drug therapy group who only achieved a systolic improvement of 24 mmHg. The control group in this study saw an improvement of 4 mmHg over the same time period. In an older study (Patel and North, 1975) with

similar parameters, a yoga group demonstrated systolic improvement of 26 mmHg without intervention. Patel and North (1975) discussed published articles that show a regular yoga routine can outperform drug therapy in managing hypertension. These multiple studies give strong support for yoga as an intervention for treating hypertension.

A literature review was published in **2002** by **James A. Raub** on the effects of Hatha yoga on musculoskeletal and cardiopulmonary function. The literature review cites published works including statistically significant improvements in strength, flexibility, blood pressure, respiration, heart rate and metabolic rate in healthy and diseased individuals. This literature review does not add new information to what has already been cited here, but serves to provide a large body of evidence to further support the information presented in this literature review. Raub's literature review presents strong supportive evidence for yoga to improve function in the above parameters.

Oken B., Kishiyama S., Zajdel D., Bourdette D., Carlsen J., Haas M., Hugos C., Kraemer D.f., Lawrence J., Mass M., 2004, published a randomized controlled trial of yoga and its effects on cognitive function, fatigue, mood, and quality of life in multiple sclerosis patients. The yoga treatment group followed a six month period. The outcome measures were the profile of mood states, state – trait anxiety inventory, multi-dimensional fatigue inventory and short form – 36. Fifty seven subjects completed the study and contributed to the results. The study concluded that over a six month period, yoga or exercise class showed statistically significant improvement in measures of fatigue compared to the control group.

DeMayo W., Singh B., Duryea B., Riley D., published a study in 2004 on the benefits of hatha yoga and meditation in patients with post-polio syndrome. Post polio syndrome is a presentation of new neuromuscular symptoms that begin after at least 15 years of stability in patients previously diagnosed with acute paralytic poliomyelitis. The study included 23 subjects who participated in a 5 day yoga and meditation retreat and were then instructed to do a 12 week video driven yoga practice at home. There were seven outcome assessment tools including Visual Analog Scale (VAS) for pain, yoga self-efficacy, fatigue severity scale, fatigue impact scale, VAS fatigue and VAS weakness. At the end of the 12 week at home self-care, all outcome measures showed statistically significant improvements except for fatigue severity scale and fatigue impact scale. Since post-polio syndrome is a disease in which preventing further deterioration is often viewed as successful treatment, these findings are important.

Yurtkuran M., Alp A., Dilek K., 2006, studied the effects of a yoga based exercise program on pain, fatigue, sleep disturbance and biochemical markers in hemodialysis patients. The study was conducted in the Nephrology Department at Uludag University faculty of medicine. Thirty seven subjects were included in the study and they performed a yoga based exercise program in groups for 30 min/day twice a week for 3 months. The control group and exercise group were given a 10 minute at home active range of motion routine. The outcome measures were VAS pain, VAS fatigue, VAS sleep disturbance, and grip strength (mmHG). Biochemical markers were urea, creatinine, and calcium, alkaline phosphatase, phosphorous, cholesterol, HDL – cholesterol, triglyceride, erythrocyte and

hematocrit. No side-effects were seen. This study suggests that a yoga-based exercise program can not only improve the subjective measures but also objectively measured blood serum parameters. It is important to understand that these subjects continued their normal hemodialysis treatments during the study and that yoga based exercise was tested as a complement to that treatment.

A case series was performed to test the effects of yoga on quality of life and flexibility in menopausal women in **Mastrangelo M., Galatino M., House L., 2007**. Six menopausal women completed the study. An Iyengar yoga program was conducted for these subjects by a registered yoga practitioner and was performed twice per week for eight weeks. The participants were also given a home based yoga program. The outcome measures were the menopausal specific quality of life (MSQOL) survey and the sit and reach test for hamstring flexibility. The Baecke questionnaire of habitual physical activity was administered at the beginning of the study to determine the subject's previous activity levels, but these measures were not reported in the study. No statistical analysis was performed in this study due to such a small participant size. The findings of the case series were that five of the six participants had a decrease in menopausal symptoms on the MSQOL survey. The sit and reach performance improved in four out of five participants. Only five subjects performed the sit and reach exercise.

Another study specific to women was conducted in **2005** by **Narendran S., nagarathna R., Narendran V., Gunasheela S., Nagendra H.**, on the effects of yoga on pregnancy outcomes. Three hundred and fifty five women enrolled in the study. Yoga sessions, including postures, breathing, and meditation were

performed one hour daily from the beginning of the study until delivery. The control group was instructed to walk 30 minutes twice a day, which is consistent with standard obstetric advice. The main outcome measures were birth weight and gestational age at delivery. There was a statistically significant increase in birth weight of babies born in the yoga group. Preterm labor was significantly lower in the yoga group. Complications like isolated intrauterine growth retardation (IUGR) and pregnancy induced hypertension were significantly lower in the yoga group. The yoga group showed no significant adverse effects during the study period. These results indicate that a daily yoga routine during pregnancy offers health benefits for pregnant women and their babies with no notable adverse effects.

Chronic diseases studied in this section include carpal tunnel syndrome, osteoarthritis, and chronic low back pain. One study was conducted by **Garfinkel M., Singhai A., Katz W., Allan D., Reshetar R., Schumacher Jr. R., 1998**, to determine the ability of yoga to relieve symptoms of carpal tunnel syndrome. The study was a randomized, single blind, controlled trial conducted in a geriatric center. Forty two subjects participated with an age range from 24-77 years of age. Subjects assigned to the yoga group participated in an 8 week, twice weekly yoga program, consisting of 11 yoga postures. The main outcome measures were grip strength, pain intensity, sleep disturbance, Phalen sign, Tinel sign and median nerve motor and sensory conduction time. Statistically significant improvements were seen in grip strength, pain and Phalen sign. No significant improvement was found in sleep disturbance, Tinel's sign, or median nerve motor and sensory

conduction time. According to this study, carpal tunnel patients may benefit from a yoga intervention when experiencing pain, loss of grip strength, and a positive Phalen sign orthopaedic test.

Garfinkel M., Schumacher Jr. R., Husain A., Levy M., Reshetar R., 1994, conducted a study to evaluate yoga benefits for treatment of osteoarthritis of the hand. Twenty five subjects completed the study. The outcome measures were range of motion of the finger joints, grip strength, tenderness of the finger joints, and circumference of the finger joints. The yoga intervention was a ten week program including eight 60 minute sessions. The control group showed no statistically significant improvements. The yoga group showed statistical improvement in tenderness in the finger joints of both hands and in the range of motion of the right hand. Combined hand variables improved significantly during activity in the yoga group compared to the control group although the same statistical significance was not present at rest. This study suggests that patients with osteoarthritis of the hands may see benefit in tenderness of the finger joints and range of motion from adopting a regular yoga routine. During the yoga sessions, patients may also see benefits in hand pain and function.

Another study, by **Sherman K., Chekrin D., Erro J., Miglioretti D., Deyo R., 2005**, was conducted to compare yoga, exercise, and self-care benefits for patients with chronic low back pain. This study was a randomized controlled trial conducted in a non-profit, integrated health care system. One hundred and one adults with chronic low back pain participated in either a, 12 week yoga, exercise, or self-care intervention. The self care intervention was an at-home instructional

exercise booklet. The outcome measures were the modified 24-point Roland Disability scale and ‘bothersomeness’ of pain 11-point numerical scale. Secondary outcomes were measured as days of restricted activity, general health status, and medication use. Results showed that back-related function in the yoga group was better than the self care or exercise group. The yoga group was also superior to the self care group in bothersomeness index. Both of these outcome measures met statistical significance after 26 weeks of intervention. This study suggests yoga is more effective in reducing chronic low back pain than a self-care book or regular exercise.

The leading causes of death in United States from the non-traumatic events are cardiovascular disease, metabolic syndromes and cancer. This literature review revealed evidence of yoga benefits for hypertension, which is an important indicator of cardiovascular function. There is a strong evidence and need for further research in yoga’s benefits on quality of life and function in the geriatric population. This is of great importance in the United States as the baby-boomer population enters retirement age. Healthcare professionals must be aware of cost-effective methods of fall prevention and maintaining independence.

As westerners become more aware of yoga as an important system to include in a healthy lifestyle it is important to realize that the literature evidence points out that yoga is a complementary and alternative therapy (CAM) and should have a place within the health care system. Yoga is not just about using muscles and relaxing, but is a system for restoring health and managing conditions. There is a risk in the western society for people to view yoga as exercise only and to miss the

healthcare benefits yoga has to offer. This literature review demonstrates yoga as a valid treatment tool for managing quality of life and/or restoring function for osteoarthritis of the hands, carpal tunnel syndrome, asthma, autonomic system control, chronic low back pain, chronic pancreatitis, basal metabolic rate, hypertension, menopause, stress and anxiety, insulin resistance, balance and gain in the elderly, pregnancy outcomes, multiple sclerosis, post-polio syndrome, serum LDH levels, and hemodialysis.

More evidence is needed in cardiovascular diseases and metabolic syndromes like Type II diabetes. Cardiovascular disease and diabetes are diseases of paramount importance as they are among the most common diseases in Western society. This poses a great opportunity for people with these diseases if further evidence demonstrates yoga effectively treating them,. Evidence within this literature review demonstrates yoga benefits for hypertensive and insulin resistant individuals.

As many of the above mentioned symptomatic conditions occur during cancer treatment and post cancer treatment, this very well throws light on availability yoga s a resort to improve quality of life among cancer patients. As yoga is further adopted into Western society it is important to remember the original doctrines that yoga was built on. Yoga is proposed to be a preventive as well as curative system of the body, mind and spirit (Garfunkel, 2000). Yoga is a system developed to benefit human physiology and is believed to affect every gland and organ in the body.

SUMMARY OF THE LITERATURE

In this chapter, twenty one reviews were presented which gives the clear picture about the present study. The reviews were collected from the areas of yoga therapy and natural diet through journals, periodicals, abstracts, unpublished master and Doctoral theses on Physical Education and Sports Sciences besides various relevant books. Hence, the present investigation assumes greater prove the concept on selected skills and performance related variables due to significance in the field of yoga.