

CHAPTER II

REVIEW OF RELATED LITERATURE

The review of literature is instrumental in the selection of the topic, formulation of hypothesis and deductive reasoning leading to the problem. It helps to get a clear idea and supports the finding with regard to the problem under study.

The researcher came across several books, periodicals and journals and published thesis, while searching for relevant facts and finding that were related to this present study, such as those were given below or the better understanding and to justify the study.

The related literature were broadly classified into the following three categories:

1. Studies on Obesity Management
2. Studies on Aerobic Training
3. Studies on Fitness variables
4. Studies on Physiological variables
5. Studies on Biochemical variables
6. Studies on Psychological variables

2.1 STUDIES ON OBESITY MANAGEMENT

Kim Y, et.al. (2009) documented that the majority of adults in the United States do not meet the recommended levels of healthy lifestyle-related behaviors. The Nutrition and Physical Activity (NuPA) study was designed to promote fruit and vegetable consumption, physical activity, and weight management for a working population. **METHOD:** Data were collected nationwide, USA, from 2005 to 2007 and analyzed in 2008. A total of 2470 employed participants were randomized into the self-help (SH: n=1191) or self-help plus telephone counseling (SH+C: n=1279) group. The SH+C group received nine structured telephone counseling sessions in addition to the print materials. **RESULTS:** A series of hierarchical regression analyses for each of the health behavior outcomes in the present-at-follow-up subsample (n=1098-1148) revealed that the SH+C was effective in increasing fruit and vegetable consumption. Among the overweight and obese participants, weight loss was significant in both the SH and SH+C groups. **CONCLUSION:** Using a theory-based behavioral change counseling technique and targeting multiple health behaviors among employed individuals, our findings demonstrate that the addition of telephone counseling to mailed self-help materials is effective in promoting healthy diet and weight management

Hills AP, et.al. (2009) reported that in both developed and developing countries, increased prevalence of obesity has been strongly associated with increased incidence of type 2 diabetes mellitus (T2DM) in the adult population. Previous research has emphasized the importance of physical activity in the

prevention and management of obesity and T2DM, and generic exercise guidelines originally developed for the wider population have been adapted for these specific populations. However, the guidelines traditionally focus on aerobic training without due consideration to other exercise modalities. Recent reviews on resistance training in the T2DM population have not compared this modality with others including aerobic training, or considered the implications of resistance training for individuals suffering from both obesity and T2DM. In short, the optimal mix of exercise modalities in the prescription of exercise has not been identified for its benefits to the metabolic, body composition and muscular health markers common in obesity and T2DM. Similarly, the underlying physical, social and psychological barriers to adopting and maintaining exercise, with the potential to undermine the efficacy of exercise interventions, have not been addressed in earlier reviews. Because it is well established that aerobic exercise has profound effects on obesity and T2DM risk, the purpose of this review was to address the importance of resistance training to obese adults with T2DM.

Wax JR. (2009) explored recent developments in obesity-related topics of interest and importance to obstetricians. Specifically addressed are the impact of gestational weight gain on perinatal risk, the increased risk of congenital anomalies in offspring, developmental origins of health and disease in offspring, and reproductive issues following bariatric surgery. **RECENT FINDINGS:** Limiting maternal weight gain in obese women to less than 15 lb may favorably attenuate perinatal risk (macrosomia, cesarean delivery, preeclampsia) but increase risk for small-for-gestational-age newborns. Obese women are at

significantly increased risk for offspring to develop open neural tube defects and congenital heart disease as well as other anomalies. Impaired sonographic visualization in this population may impede prenatal diagnosis of these serious birth defects. Intrauterine nutritional overabundance may cue adaptive fetal responses predisposing to childhood and adult obesity as well as the metabolic syndrome. Bariatric surgery, the only effective treatment for morbid obesity, causes lifelong physiologic and anatomic changes associated with significant reproductive implications. Procedures can predispose to caloric and micronutrient deficiencies, improved fertility and fecundity, and late surgical complications. Pregnancy outcomes are typically similar to those of women without previous bariatric surgery and better than those of untreated morbidly obese women. SUMMARY: Obesity and its surgical treatment are associated with lifelong health implications for the mother as well as her offspring. An appreciation of these obesity-related reproductive issues is critical for optimal care of this growing segment of the female population.

Florindo AA, (2009) estimated the prevalence of and identify factors associated with physical activity in leisure, transportation, occupational, and household settings. METHODS: This was a cross-sectional study aimed at investigating living and health conditions among the population of São Paulo, Brazil. Data on 1318 adults aged 18 to 65 years were used. To assess physical activity, the long version of the International Physical Activity Questionnaire was applied. Multivariate analysis was conducted using a hierarchical model. RESULTS: The greatest prevalence of insufficient activity related to transportation (91.7%), followed by leisure (77.5%), occupational (68.9%), and

household settings (56.7%). The variables associated with insufficient levels of physical activity in leisure were female sex, older age, low education level, nonwhite skin color, smoking, and self-reported poor health; in occupational settings were female sex, white skin color, high education level, self-reported poor health, nonsmoking, and obesity; in transportation settings were female sex; and in household settings, with male sex, separated, or widowed status and high education level. CONCLUSION: Physical activity in transportation and leisure settings should be encouraged. This study will serve as a reference point in monitoring different types of physical activities and implementing public physical activity policies in developing countries.

Pi-Sunyer X. (2009) reported that obesity is at epidemic proportions in the United States and in other developed and developing countries. The prevalence of obesity is increasing not only in adults, but especially among children and adolescents. In the United States in 2003 to 2004, 17.1% of children and adolescents were overweight, and 32.2% of adults were obese. Obesity is a significant risk factor for and contributor to increased morbidity and mortality, most importantly from cardiovascular disease (CVD) and diabetes, but also from cancer and chronic diseases, including osteoarthritis, liver and kidney disease, sleep apnea, and depression. The prevalence of obesity has increased steadily over the past 5 decades, and obesity may have a significant impact on quality-adjusted life years. Obesity is also strongly associated with an increased risk of all-cause mortality as well as cardiovascular and cancer mortality. Despite the substantial effects of obesity, weight loss can result in a significant reduction in risk for the majority of these comorbid conditions. Those comorbidities most

closely linked to obesity must be identified to increase awareness of potential adverse outcomes. This will allow health care professionals to identify and implement appropriate interventions to reduce patient risk and mortality. A systematic search strategy was used to identify published literature between 1995 and 2008 that reported data from prospective longitudinal studies of obesity and comorbid medical conditions. This article will review evidence for significant associations of obesity with comorbidities to provide information useful for optimal patient management.

Pestana IA, (2009) documented that the condition of "buried" penis may arise from several factors. Although the pediatric form is a rare congenital disorder, it may become an acquired condition in adulthood, most commonly from obesity, radical circumcision, or penoscrotal lymphedema. As obesity has become a national epidemic, the incidence of this phenomenon will inevitably increase. The purpose of this article is to present current strategies in the management of this physically and psychologically debilitating condition. **METHODS:** A literature review of the surgical management of buried penis was obtained mainly in the plastic surgery and urology literature (PubMed), from 1977 to 2007. **RESULTS:** Several risk factors were identified in adult patients with buried penis, including morbid obesity and diabetes mellitus. Multiple techniques for release and reconstruction are described, including primary closure, Z-plasty, and skin resurfacing, all of which may or may not include a lipectomy. Recent publications focus on resurfacing with split-thickness skin grafts and negative-pressure dressings. These techniques have been successful in terms of graft survival and long-term cosmetic result. **CONCLUSIONS:** Buried

penis is an unusual, difficult-to-treat condition that presents a unique challenge to the plastic surgeon and the urologist. Predisposing factors such as morbid obesity and diabetes mellitus are becoming increasingly prevalent, which suggests a potential increase in the incidence of this condition. Although no specific approach may be applicable to all patients, a combination of various techniques may be applied. In complicated and severe cases, a split-thickness skin graft to the penile shaft, reduction scrotoplasty, suction-assisted lipectomy, and/or surgical lipectomy, such as panniculectomy, may be indicated. Therapy adapted to the individual patient can result in high rates of successful reconstruction with acceptable cosmetic results.

Quintero P, (2009) documented that obesity is nowadays a major public health problem. The World Health Organization reported that globally 400million adults are obese, and the situation seems to raise in the future. Furthermore, obesity is a major risk factor for a number of chronic diseases such as type 2 diabetes, cardiovascular diseases and the metabolic syndrome. Interestingly, several studies have reported that appetite suppression and body weight loss are frequently observed at high altitude. This observation has opened some possibilities for losing weight under hypoxia or living in altitude. Nevertheless, the triggering mechanisms for the decrease in energy intake in hypoxic conditions still remain unclear as well as the impact on body mass components. On the other hand, obese subjects often present a chronic inflammatory state on the adipose tissue that might have a strong relationship with onset and development of obesity-related diseases. Thus, it has been consistently reported that adipose tissue of obese subjects is poorly oxygenated

and that this hypoxia state is a new potential risk factor for the chronic inflammation in obesity. In this sense, oxygen therapy is a common technique used in current medicine for the treatment of several diseases, while animal studies have demonstrated that treatment with hyperoxia produces some beneficial effects in different diseases related with lack of oxygen in several organs. In this article, we review the role of oxygen availability in body weight homeostasis and hypothesize the possible applicability of hypoxia and hyperoxia for the treatment of obesity and related disorders.

Ma J, (2009) reported that efficacy research has shown that intensive individual lifestyle intervention lowers the risk for developing type 2 diabetes mellitus and the metabolic syndrome. Translational research is needed to test real-world models of lifestyle interventions in primary care settings. DESIGN: E-LITE is a three-arm randomized controlled clinical trial aimed at testing the feasibility and potential effectiveness of two lifestyle interventions: information technology-assisted self-management, either alone or in combination with care management by a dietitian and exercise counselor, in comparison to usual care. Overweight or obese adults with pre-diabetes and/or metabolic syndrome (n = 240) recruited from a community-based primary care clinic are randomly assigned to one of three treatment conditions. Treatment will last 15 months and involves a three-month intensive treatment phase followed by a 12-month maintenance phase. Follow-up assessment occurs at three, six, and 15 months. The primary outcome is change in body mass index. The target sample size will provide 80% power for detecting a net difference of half a standard deviation in body mass index at 15 months between either of the self-management or care

management interventions and usual care at a two-sided alpha level of 0.05, assuming up to a 20% rate of loss to 15-month follow-up. Secondary outcomes include glycemic control, additional cardiovascular risk factors, and health-related quality of life. Potential mediators (e.g., treatment adherence, caloric intake, physical activity level) and moderators (e.g., age, gender, race/ethnicity, baseline mental status) of the intervention's effect on weight change also will be examined. **DISCUSSION:** This study will provide objective evidence on the extent of reductions in body mass index and related cardiometabolic risk factors from two lifestyle intervention programs of varying intensity that could be implemented as part of routine health care.

Corella D, et.al. (2009) documented Nutrigenetics studies the role of genetic variation on interactions between diet and health, aiming to provide more personalized dietary advice. However, replication has been low. Our aim was to study interaction among a functional APOA2 polymorphism, food intake, and body mass index (BMI) in independent populations to replicate findings and to increase their evidence level. **METHODS:** Cross-sectional, follow-up (20 years), and case-control analyses were undertaken in 3 independent populations. We analyzed gene-diet interactions between the APOA2 -265T>C polymorphism and saturated fat intake on BMI and obesity in 3462 individuals from 3 populations in the United States: the Framingham Offspring Study (1454 whites), the Genetics of Lipid Lowering Drugs and Diet Network Study (1078 whites), and Boston-Puerto Rican Centers on Population Health and Health Disparities Study (930 Hispanics of Caribbean origin). **RESULTS:** Prevalence of the CC genotype in study participants ranged from 10.5% to 16.2%. We identified statistically

significant interactions between the APOA2 -265T>C and saturated fat regarding BMI in all 3 populations. Thus, the magnitude of the difference in BMI between the individuals with the CC and TT+TC genotypes differed by saturated fat. A mean increase in BMI of 6.2% (range, 4.3%-7.9%; $P = .01$) was observed between genotypes with high- ($>$ or $=22$ g/d) but not with low- saturated fat intake in all studies. Likewise, the CC genotype was significantly associated with higher obesity prevalence in all populations only in the high-saturated fat stratum. Meta-analysis estimations of obesity for individuals with the CC genotype compared with the TT+TC genotype were an odds ratio of 1.84 (95% confidence interval, 1.38-2.47; $P < .001$) in the high-saturated fat stratum, but no association was detected in the low-saturated fat stratum (odds ratio, 0.81; 95% confidence interval, 0.59-1.11; $P = .18$). CONCLUSION: For the first time to our knowledge, a gene-diet interaction influencing BMI and obesity has been strongly and consistently replicated in 3 independent populations.

2.2 STUDIES ON AEROBIC TRAINING

Cadmus L, et.al. (2010) evaluated the effectiveness of a community-based aquatic exercise program for improved quality of life among persons with osteoarthritis. METHOD: Two hundred forty-nine adults with osteoarthritis were enrolled in a 20-wk randomized controlled trial of a preexisting community-based aquatic exercise program versus control. Intervention group participants ($n = 125$) were asked to attend at least two aquatic exercise sessions per week. Control group participants ($n = 124$) were asked to maintain their usual activity levels. Demographics were collected at baseline, and patient-reported outcomes

were collected at baseline and after 10 and 20 wk. Depressive symptoms, self-efficacy for pain and symptom control, physical impairment, and activity limitation were tested as potential mediators of the relationship between aquatic exercise and perceived quality of life (PQOL). Body mass index (BMI), ethnicity, self-rated health, and comorbidity were tested as possible moderators. RESULTS: Aquatic exercise had a positive impact on PQOL scores ($P < 0.01$). This effect was moderated by BMI ($P < 0.05$) such that benefits were observed among obese participants ($BMI \geq 30$), but not among normal weight or overweight participants. None of the tested variables were found to mediate the relationship between aquatic exercise and PQOL scores. CONCLUSIONS: Given the availability of existing community aquatics programs, aquatic exercise offers a therapeutic and pragmatic option to promote quality of life among individuals who are living with both obesity and osteoarthritis. Future investigation is needed to replicate these findings and develop strategies to increase long-term participation in aquatics programs.

Jones LW,(2009) evaluated cardiorespiratory fitness, skeletal muscle function, and body composition of patients with newly diagnosed and untreated, postsurgical primary malignant glioma. METHODS:: By using a cross-sectional design, patients with clinically stable (10 +/- 7 days postsurgery) high-grade glioma (HGG; $n = 25$) or low-grade glioma (LGG; $n = 10$) were studied. Participants performed a cardiopulmonary exercise test (CPET) with expired gas analysis to assess cardiorespiratory fitness (peak oxygen consumption, VO_{2peak}). Other physiological outcomes included skeletal muscle cross-sectional area (CSA; magnetic resonance imaging), isokinetic muscle strength

(isokinetic dynamometer), and body composition (air displacement plethysmography). Quality of life was assessed with the Functional Assessment of Cancer Therapy-Brain scale. RESULTS:: CPET was a feasible and safe procedure to assess VO(2peak), with no serious adverse events. VO(2peak) indexed to total body weight and lean body mass (LBM) for both groups was 13.0 mL . weight . min(-1) and 19 mL . LBM . min(-1), the equivalent to 59% and 38% below age- and sex-predicted normative values, respectively. Skeletal muscle strength and mid-thigh CSA were lower in HGG relative to LGG patients (83 vs 125 Nm, P = .025; 94 vs 119 cm(2), P = .171, respectively). Skeletal muscle isokinetic strength, CSA, and body composition outcomes predicted VO(2peak) (r = -0.59 to 0.68, P < .05). CONCLUSIONS:: Postsurgical glioma patients have markedly reduced cardiorespiratory fitness, isokinetic strength, and CSA. Prospective studies are now required to determine whether such abnormalities influence treatment toxicity and clinical outcome as well as to test the effect of appropriately selected interventions to prevent and/or mitigate dysfunction.

Molenaar EA, (2009) compared the effects of nutritional counselling with nutritional plus exercise counselling on body weight and waist circumference in overweight adults in a multidisciplinary primary care setting. METHODS: One hundred and thirty-four overweight adults (body mass index 28-35) were randomly assigned to individual counselling sessions by a dietician (D) or counselling sessions by a dietician plus physiotherapist (D + E) during 6 months with one follow-up session at 12 months. Outcomes were assessed at baseline, 6 and 12 months. Difference in changes of outcome measures between

groups were analysed using generalized estimating equations. **RESULTS:** Weight reduced from baseline to 6 months in D [-2.2 (-3.1 to -1.4) kg] and D + E [-3.0 (-4.0 to -2.0) kg] and was sustained at 12 months [-2.0 (-3.1 to -1.4) kg and -3.1 (-4.5 to -1.6) kg, respectively]. The reduction in weight did not significantly differ between D and D + E ($P = 0.48$). In both groups, waist circumference decreased from baseline to 6 months [-2.1 (-3.3 to -0.8) cm for D; -3.7 (-5.1 to -2.3) cm for D + E] and was sustained at 12 months [-2.1 (-3.5 to -0.7) cm and -4.2 (-6.0 to -2.5) cm, respectively]. Participants in D + E tended to decrease their waist circumference more than those in D ($P = 0.14$). **Discussion.** Nutritional counselling by a dietician resulted in modest reductions in weight and waist circumference in overweight adults, which were sustained up to 12 months. Adding exercise counselling by a physiotherapist did not significantly enhance the effect on body weight. Exercise counselling may, however, further improve waist circumference.

Goulopoulou S (2009) examined the effect of aerobic exercise training on vagal and sympathetic influences on the modulations of heart rate and systolic blood pressure in response to an oral glucose load in obese individuals with and without type 2 diabetes mellitus (T2D). Beat-to-beat arterial pressure and continuous electrocardiogram were measured after a 12-hour overnight fast and in response to glucose ingestion (75 g dextrose) in obese subjects with (T2D group, $n = 23$) and without (OB group, $n = 36$) T2D before and after 16 weeks of aerobic exercise training at moderate intensity. Autonomic modulation was assessed using spectral analysis of systolic blood pressure variability (BPV), heart rate variability (HRV), and analysis of baroreflex sensitivity (BRS).

Glucose ingestion significantly increased low-frequency (LF(SBP)), low-frequency HRV (LF(RRI)), and the ratio of low- to high-frequency components of HRV (LF(RRI)/HF(RRI)), and decreased the high-frequency power (HF(RRI)) ($P < .05$). Exercise training increased LF(RRI) and LF(RRI)/HF(RRI) responses, and reduced HF(RRI) and LF(SBP) to glucose ingestion in both groups ($P < .05$), but increased fasted BRS in the OB group only ($P < .05$); glucose intake had no effect on BRS ($P > .05$). In conclusion, a 16-week exercise training program improved cardiac autonomic modulation in response to an oral glucose load in obese adults, independently of diabetes status, and in the absence of remarkable changes in body weight, body composition, fitness level, and glycemic control.

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Kemp JP.(2009), reported that exercise-induced bronchoconstriction (EIB) is very common in both patients with asthma and those who are otherwise thought to be normal. The intensity of exercise as well as the type of exercise is important in producing symptoms. This may make some types of exercise such as swimming more suitable and extended running more difficult for patients with this condition. A better understanding of EIB will allow the physician to direct the patient towards a type of exercise and medications that can result in a more active lifestyle without the same concern for resulting symptoms. This is especially important for schoolchildren who are usually enrolled in physical education classes and elite athletes who may desire to participate in competitive sports. Fortunately several medications (short- and long-acting beta(2)-agonists, cromolyn, nedocromil, inhaled corticosteroids, and more recently leukotriene modifiers) have been shown to be effective in preventing or attenuating the

effects of exercise in many patients. In addition, inhaled beta(2)-agonists have been shown to quickly reverse the airway obstruction that develops in patients and continue to be the reliever medications of choice. Inhaled corticosteroids are increasingly being recommended as regular therapy now that the role of inflammation and airway injury has been identified in EIB. With the discovery that there is a release of mediators such as histamine and leukotrienes from cells in the airway following exercise with resulting airway obstruction in susceptible individuals, interest has turned to attenuating their effects with mediator antagonists especially those that block the effects of leukotrienes. Studies with an oral leukotriene antagonist, montelukast, have shown beneficial effects in adults and children aged as young as 6 years with EIB. These effects can be demonstrated as soon as two hours and as long as 24 hours after administration without a demonstrated loss of a protective effect after months of treatment. The studies leading up to and resulting in an approval of montelukast for EIB for patients aged 15 years and older are reviewed in this paper.

Dobrosielski DA, (2009) reported that Nitric oxide (NO) may play a critical role in facilitating the delivery of blood to active skeletal muscle, ultimately impacting functional health in older adults. Plasma nitrite is a useful marker of vascular NO bioavailability. The aim of the current investigation was to examine the effect of a widely used physical function test on plasma nitrite concentrations in older adults. Methods: Venous blood was drawn before, immediately following, and 10 minutes following the completion of a 400-m walk test. Blood samples were added to heparin and frozen for subsequent analysis of nitrite levels using chemiluminescence. Results: Twenty six (79 +/- 4

years) women participated in this study. Plasma nitrite levels decreased approximately 22% from baseline following a 400-m walk. Percent change in plasma nitrite was related to walking speed ($r=-.550$, $p=0.004$). Conclusions: These data suggest an alteration in plasma nitrite concentration following a functional test which may impact functional health.

Merom D, (2009) documented that walking is the most prevalent form of leisure time physical activity (LTPA). Advances in measurement of walking depend on understanding sources of error in self report. We examined the effect of prompting "walking for exercise, recreation, and sport" (WERS) upon surveillance estimates of LTPA and assessed what types of walking were recalled when reporting LTPA generally and when WERS was prompted specifically. **METHODS:** Data were collected by telephone survey from a random sample of 3,415 Australian adults ($> \text{ or } = 15 \text{ yrs}$). Respondents were asked first to recall any type of LTPA they participated in (unprompted) and if walking was not mentioned, WERS was prompted. All walkers were asked to describe the type of walking they did. Open-ended responses were categorized according to physical activity measurement dimensions. **RESULTS:** Forty three percent did not report WERS unless prompted to do so. The prevalence of meeting recommendations by all LTPA was reduced by 10% for both genders and across all age groups if not prompted to recall WERS. The interpretation of WERS was broad and included travel related walking and dog walking whether unprompted or prompted. **CONCLUSIONS:** Current challenges in walking surveillance include ensuring that both researchers and respondents understand WERS in a standardized manner.

Arbour-Nicitopoulos KP (2009) documented that planning, leisure-time physical activity, and coping self-efficacy in persons with spinal cord injury: a randomized controlled trial. **OBJECTIVE:** To examine the effects of action and coping planning (ACP) on leisure-time physical activity (LTPA) and coping self-efficacy in exercise initiates living with spinal cord injury (SCI). **DESIGN:** Ten-week, single-blind randomized controlled trial. **SETTING:** General community. **PARTICIPANTS:** Adults (N=44) with SCI (mean age +/- SD, 49.70+/-12.71y) were randomly assigned to either an action planning only (APO; n=22) or an ACP (n=22) condition. **INTERVENTION:** Participants in the APO condition formed action plans for LTPA at weeks 1 and 5, and self-monitored their LTPA behavior. Those in the ACP condition formed coping plans for managing self-identified activity barriers, in addition to forming action plans and self-monitoring. **MAIN OUTCOME MEASURES:** Measures of intentions, coping self-efficacy, and behavior were assessed at weeks 1, 5, and 10. **RESULTS:** Intention-to-treat analyses indicated that persons in the ACP condition reported significantly greater LTPA, scheduling, and general barriers self-efficacy at weeks 5 and 10, in comparison with those in the APO condition. Scheduling self-efficacy mediated the effects of the intervention on LTPA, accounting for 38% of the total effect of the intervention on week 5 LTPA. **CONCLUSIONS:** These findings illustrate the effectiveness of supplementing action plans with coping plans for enhancing LTPA and coping self-efficacy beliefs among exercise initiates living with SCI.

Crognale D, (2009) documented that previous research has shown that a novel form of neuro-muscular electrical stimulation (NMES) can be used to bring

about aerobic training effects in sedentary adults and in patients with heart failure. However, it is not clear whether this form of NMES could induce a significantly strong cardiovascular exercise effect in a more active group where a greater stimulus is required for training. In this study we investigated the aerobic training effects of repeated exposure to low frequency NMES in a group of physically active healthy adults. Results demonstrated a clinically and statistically significant training response following 18 trainings sessions, suggesting that this form of NMES has a role to play in cardiovascular exercise training in a physically active healthy population.

John D, (2009) assessed differences between seated and walking conditions on motor skills and cognitive function tests. **METHODS:** Eleven males (24.6 +/- 3.5 y) and 9 females (27.0 +/- 3.9 y) completed a test battery to assess selective attention and processing speed, typing speed, mouse clicking/drag-and-drop speed, and GRE math and reading comprehension. Testing was performed under seated and walking conditions on 2 separate days using a counterbalanced, within subjects design. Participants did not have an acclimation period before the walking condition. **RESULTS:** Paired t tests ($P < .05$) revealed that in the seated condition, completion times were shorter for mouse clicking (26.6 +/- 3.0 vs. 28.2 +/- 2.5s) and drag-and-drop (40.3 +/- 4.2 vs. 43.9 +/- 2.5s) tests, typing speed was greater (40.2 +/- 9.1 vs. 36.9 +/- 10.2 adjusted words x min⁻¹), and math scores were better (71.4 +/- 15.2 vs. 64.3 +/- 13.4%). There were no significant differences between conditions in selective attention and processing speed or in reading comprehension. **CONCLUSION:** Compared with the seated condition, treadmill walking caused a 6% to 11%

decrease in measures of fine motor skills and math problem solving, but did not affect selective attention and processing speed or reading comprehension.

Ranieri M, (2009) evaluated the effects of alpha-lipoic acid (ALA) and gamma-linolenic acid (GLA) and the beneficial effect of physical exercise on positive sensory symptoms and neuropathic pain in patients with compressive radiculopathy syndrome from disc-nerve root conflict. Often these painful syndromes after the acute event, tend to recur becoming subacute or chronic syndromes that become for the period of interest disabling is an event very important in these cases proper prevention, based on a maintenance drug therapy and the strengthening exercises of paravertebral muscles, flexibility exercises on the spine and when needed on the reduction of body weight. In this Observational Cohort, two-arm trial, 203 patients were enrolled and divided into two groups, the first, ALA and GLA group, (n = 101) received oral dose of 600 mg of alpha-lipoic acid (ALA) and 360 mg of gamma-linolenic acid (GLA) and a rehabilitation program for six weeks, the second (n = 102) treated with only rehabilitation program. Patients were recruited at the centre of Physical Medicine and Rehabilitation, they underwent a physiatric examination at the primary outcome (t0) and secondary outcomes were recorded at monitoring visits scheduled at two weeks = t1, four weeks = t2, six weeks = t3, and at the same has been administered the following scale: VAS scale, SF-36, Oswestry Low Back Pain Disability Questionnaire, Aberdeen Back Pain Scale (ABPS), Revised Leeds Disability Questionnaire (LDQ), Roland and Morris Disability Questionnaire. Significant improvements was noted in the ALA and GLA group for paresthesia, stabbing and burning pain, as showed by VAS (Visual Analogue Scale),

Oswestry Low Back Pain Disability Questionnaire, Aberdeen Low Back Pain Scale; also, improvements of quality of life has been noted, in the same group, as showed by SF-36, LDQ (Revised Leeds Disability Questionnaire), Roland and Morris disability questionnaire. All these outcome measure showed statistically significant decreases. Oral treatment with alpha-lipoic acid (ALA) and gamma-linolenic acid (GLA) for six weeks in synergy with rehabilitation therapy improved neuropathic symptoms and deficits in patients with radicular neuropathy.

2.3 STUDIES ON FITNESS VARIABLES

Viskić, et.al. (2007) analyzed the impact of special programmed physical education including dance, aerobics and rhythmic gymnastics on the development of motor and functional abilities and morphological characteristics of female fourth-grade high-schoolers in Zagreb. A total sample of 220 high-schoolers aged 16-18 years were divided into two groups: experimental group of 115 students attending the program composed of dance structures and aerobics, and control group of 105 students attending classic program of physical education. A set of 3 morphological variables, 6 motor variables and one functional variable were applied in both groups on three occasions during an academic year (initial, transient and final measurements). Two-factor analysis of variance (MANOVA repeated measure design) showed the experimental program to significantly influence the development of coordination/agility and specific rhythm coordination, functional aerobic ability, repetitive and explosive strength and flexibility, along with significant reduction of overweight and

adipose tissue. Study results clearly indicate that the existing programs of physical education should be revised and replaced by more appropriate ones.

Lee, Yi and Kim .(2007) studied the comparison of the effects of an exercise program in non-obese and obese women. The purpose of this study was to compare the effects of an exercise program on physical fitness, obesity indices, and blood lipids in cases of non-obese and obese women. Data was collected from May, 2006 to November, 2006 in a public health center. All Subjects(37 women) participated in an exercise program that consisted of Latin dance, muscular strength training, and dumbbell exercises. Thirty-seven women were divided into two groups(16 non-obese women and 21 obese women) by %body fat. After 8 weeks, the effects of treatment were compared between pre-test and post-test in each group. Physical fitness (abdominal muscle strength, muscle endurance, flexibility, agility, balance) was significantly different between the pre-test and post-test in the non-obese and obese group. Obesity indices(body weight, BMI) was significantly different in obese women after the 8-week exercise program. There was no decrease of blood lipids in either group. These findings indicate that an exercise program could be an effective nursing intervention to increase physical fitness in non-obese and obese women and to decrease obesity indices(body weight, BMI) in obese women.

Tsourlou, et.al. (2006) examined the effectiveness of a 24-week aquatic training (AT) program, which included both aerobic and resistance components, on muscle strength (isometric and dynamic), flexibility, and functional mobility in healthy women over 60 years of age. Twenty-two subjects were assigned

randomly to either an AT (n = 12) or a control (C, n = 10) group. Volunteers participated in a supervised shallow-water exercise program for 60 minutes a day, 3 days a week; the exercise program consisted of a 10-minute warm-up and stretching, 25 minutes of endurance-type exercise (dancing) at 80% of heart rate (HR)(max), 20 minutes of upper- and lower-body resistance exercises with specialized water-resistance equipment, and a 5-minute cool down. Maximal isometric torque of knee extensors (KEXT) and knee flexors (KFLEX) were evaluated by a Cybex Norm dynamometer, grip strength (HGR) was evaluated using a Jamar hydraulic dynamometer, and dynamic strength was evaluated via the 3 repetition maximum (3RM) test for chest press, knee extension, lat pull down, and leg press. Jumping performance was evaluated using the squat jump (SJ), functional mobility with the timed up-and-go (TUG) test, and trunk flexion with the sit-and-reach test. Body composition was measured using the bioelectrical impedance method. The AT induced significant improvements in KEXT (10.5%) and KFLEX (13.4%) peak torque, HGR strength (13%), 3RM (25.7-29.4%), SJ (24.6%), sit-and-reach (11.6%), and TUG (19.8%) performance. The AT group demonstrated a significant increase in lean body mass (3.4%). No significant changes in these variables were observed in the C group. The results indicate that AT, with both aerobic and resistance components, is an alternative training method for improving neuromuscular and functional fitness performance in healthy elderly women.

Mahrová , Bunc and Fischerová (2006) conducted the Motor skills testing in patients with chronic renal failure.). The aim of our study was to choose an acceptable motor tests battery, which should target such components

of motor performance, whose certain rate is necessary for self-sufficiency keeping and perform activities of daily living. He observed mixed group of 23 patients. For evaluation of the functional condition we used the "Senior Fitness Test Manual" (8), which measures these physical attributes: muscle strength, physical endurance, flexibility, agility and balance. The input results we compared with population standard specification used in the test battery. Results of the tests showed that the group of patients in comparison with the population standard specification have reached subnormal and risk performances, especially in tests requiring for its implementation muscular strength of lower extremities and physical efficiency. Normal and above normal performances we observed in patients that were physically active before and during regular dialysis treatment. After the evaluation of result, he consider the selected battery of motor tests as an acceptable choice for motor skills testing in renal dialyzed patients all age categories.

Gappmaier. et.al. (2006) examined the aerobic exercise in water versus walking on land. effects on indices of fat reduction and weight loss of obese women. To test this hypothesis 38 middle-aged obese women (25-47% body fat) participated in a 13 week exercise-diet program to compare the effects of aerobic exercise in water versus walking on land on indices of fat reduction and weight loss changes. Subjects were randomly assigned to 1 of 3 exercise groups: 1) walking on land (WL), 2) swimming (SW) at 27 degrees C water temperature and 3) walking in 29 degrees C water (WW) at the shallow end of a declining pool with the water at navel height. Subjects in the SW group alternated breast-, side-, and backstroke swimming without face immersion. Exercise parameters

were kept constant for all three groups. Subjects participated in supervised exercise sessions for 40 min, 4 times a week at 70% of age-predicted maximum heart rate. Subjects were tested before and after the 13-week experimental period. Significant reductions in body weight, (5.9 kg), percent body fat, (3.7%), and skin fold and girth measurements, occurred in all groups. There were no significant differences between groups. The results of this study indicate that there are no differences in the effect of aerobic activities in the water versus weight-bearing aerobic exercise on land on body composition components as long as similar intensity, duration and frequency are used.

Burgess , Grogan and Burwitz (2006) investigated the effects of 6-week aerobic dance on these variables with 50 British schoolgirls aged 13-14 years. A cross-over design was used with two equivalent groups taught normal physical education and aerobic dance in a different order. The Body Attitude Questionnaire (BAQ) and Children and Youth Physical Self-Perception Profile (CY-PSPP) were administered as pre, mid and post-test to each participant in each group before the first intervention, at the change over and after 12 weeks. The results of this study revealed that participation in 6 weeks of aerobic dance significantly reduced body image dissatisfaction (Attractiveness, Feeling Fat, Salience and Strength and Fitness) and enhanced physical self-perceptions (Body Attractiveness and Physical Self-Worth), although these improvements were not sustained.

Lewis (2005) had conducted a study to determine the effects of a home exercise program of combined aerobic and strength training on fitness with a

10.5-year-old girl with Down syndrome (DS). Measurements included cardiovascular variables, strength, body composition, flexibility, and skill. The subject participated in a home exercise program: 30 to 60 minutes of moderate-to high-intensity exercise five to six days per week for six weeks. The cardiovascular variables monitored were heart rate, respiration rate, and oxygen consumption during a submaximal treadmill stress test. Other measures included 10-repetition maximal strength of selected muscle groups, body mass index, flexibility, Gross Motor Scales of the Bruininks-Oseretsky Test of Motor Proficiency, and anaerobic muscle power. Improvements in submaximal heart and respiration rates, aerobic performance, muscle strength and endurance, gross motor skills, and anaerobic power were observed for this subject. Body weight and flexibility were unchanged.

Obert, P. et.al. (2001) had conducted a study on the effect of a 13 week aerobic training programme on the maximal power developed during a force velocity test in prepubertal boys and girls. Boys and girls (10 – 11 yr), participating in physical activities, served as subjects. One group (M=9, F=8) participated in an extra one hour aerobic training session twice a week for 13 weeks, while others (M=8; F=8) served as controls. A force velocity test (an anaerobic test) was performed on a friction-loaded cycle ergometer. Experimental training consisted on one set of interval runs (intensity = 90 + % of HR max) and a continuous run (intensity = 75-80% of HR max). Maximal power increased significantly in the trained group even when muscle mass change was accounted for. The increase was due mainly to force production because velocity was not altered. No changes were noted in the control group. It was concluded

that aerobic training in prepubertal children actually altered the anaerobic performance factors of force and power production. Aerobic training in children influences anaerobic performances.

Kraemer et.al. (2001) conducted a study on resistance training combined with bench-step aerobics which enhances women's health profile. Thirty-five healthy, active women were randomly assigned to one of four groups that either a) performed 25 min of BSA only (SA25); b) performed a combination of 25 min of BSA and a multiple-set upper and lower body resistance exercise program (SAR); c) performed 40 min of BSA only (SA40); or d) served as a control group (C), only performing activities of daily living. Direct assessments for body composition, aerobic fitness, muscular strength, endurance, power, and cross-sectional area were performed 1 wk before and after 12 wk of training. All training groups significantly improved peak VO_2 (3.7 to 5.3 mL O_2 .kg⁻¹.min⁻¹), with the greatest improvement observed in the SAR group ($P = 0.05$). Significant reductions in preexercise heart rates (8-9 bpm) and body fat percent (5--6%) were observed in all training groups after training. Significant reductions in resting diastolic blood pressure were observed for the SAR and SA40 groups (6.7 and 5.8 mm Hg, respectively). Muscular strength and endurance only improved significantly in the SAR group (21 and 11% respectively). All groups demonstrated increased lower body power (11--14%), but only the SAR group significantly improved upper body power (32%). Thigh muscle cross-sectional areas measured via magnetic resonance imaging (MRI) increased primarily for the SAR group. BSA is an exercise modality effective for improving physical fitness and body composition in healthy women. The addition

of resistance exercise appears to enhance the total fitness profile by improving muscular performances, muscle morphology, and cardiovascular fitness greater than from performing BSA alone. Therefore, the inclusion of both modalities to an exercise program is most effective for improving total body fitness and a woman's health profile.

Engles , et.al. (1998) examined the effects of low-impact, moderate-intensity exercise training with and without wrist weights ($0.68 \text{ kg}\cdot\text{wrist}^{-1}$) on functional capacities and mood states in older adults (age 68.6 ± 5.6 , mean \pm SD). Twenty-three senior citizens residing in the community were randomly assigned to wrist weight (WW; $n = 12$) and no-wrist weight (NW; $n = 11$) exercise groups while 11 matched subjects served as non-exercise controls (NE). Exercise training was performed for 10 weeks, 3 days/week, for 60 min/session and consisted of low-impact aerobic dance (50-70% of maximal heart rate) combined with exercises to promote muscular fitness, flexibility, and balance. Before and after the intervention, each participant's aerobic fitness, muscular strength, flexibility, static and dynamic balance, skinfold thickness, and psychological mood states were assessed under standardized testing conditions. Exercise training resulted in significant improvements in peak oxygen uptake, lower extremity muscle strength, and psychological vigor ($p < 0.05$) but did not affect other fitness components ($p > 0.05$). There were no differences between the WW and NW exercise groups for any of the same variables studied ($p > 0.05$). No significant pre- to post-test changes were found for the NE control group ($p > 0.05$). It is concluded that 10 weeks of low-impact, moderate-intensity exercise training of the type that can be considered well-rounded in nature provides a

sufficient stimulus to augment aerobic fitness, beneficially affects leg strength, and increases feelings of vigor in older adults. The present observations indicate that the use of light wrist weights has no beneficial or adverse effects on the measured training outcomes.

Scharff et al (1997) to determine the effect of vertical impact forces during bench-step aerobics: exercise rate and experience, randomly performed 8-min. protocols of the "basic" bench-stepping technique and a more advanced "travel" technique at 30 and 33 cycles.min.⁻¹. Analysis showed that the faster exercise rate yielded significantly higher vertical impact forces on a reference (B-8) step height (20.3 cm). At 33 cycles.min.⁻¹, the instructors, and novices' responses were both higher than those at 30 cycles.min.⁻¹. The mean peak vertical impact force ranged from 1.54 times the body weight for the novice group at 30 cycles.min.⁻¹ to 1.87 times the body weight for instructors at 33 cycles.min.⁻¹. A comparison of the groups' force curves showed a distinctive pattern in the loading of the impact forces. Specifically, the instructors consistently produced a transitory decrement in force prior to attaining peak force. In addition, the novices exhibited nonuniform increases in the production of vertical impact force across other step heights at the faster (33 cycles.min.⁻¹) speed. Thus, experience with bench-step exercise may afford an ability to make uniform and force-absorbing adjustments in the resultant vertical impact forces at increased speeds.

Frangolias, Rhodes, and Taunton (1996) compared the cardiovascular responses of maximal deep water running to treadmill running utilizing 22

endurance runners (8 female, 14 males, ages 21 to 35 yr) who were divided into experienced and inexperienced deep water running groups and given maximal exertion tests on the treadmill and in the water. Experienced deep water runners were classified as those doing at least 6 deep water running workouts per month for 6 months prior to the study. Results indicated that the more familiar subjects were with deep water running, the smaller the difference in maximal oxygen uptake values between water and land running. Experienced deep water runners had VO_{2max} values on land and in water that were within 3.8 ml/kg/min whereas the difference in the inexperienced deep water runners was 10.3 ml/kg/min. Underwater video analysis revealed that inexperienced deep water runners were unable to maintain upright positions in the water and more likely to cup the water with their hands, propelling themselves slightly forward. Leg patterns of the inexperienced deep water runners adapted to a shorter stride cycle, similar to a swimming kick motion, which increased the contribution of the upper body. Maximal heart rate results indicated no significant differences in maximal heart rate in land vs. water in the experienced deep water runners. The researchers concluded that the more familiar individuals are with deep water running, the more closely matched the physiological responses of the two exercise mediums.

2.4 STUDIES ON PHYSIOLOGICAL VARIABLES

Zaros PR, et.al. (2009) investigated the effects of 6 months of dynamic exercise training (ET) on blood pressure and plasma nitrate/nitrite concentration (NO_x^-) in hypertensive postmenopausal women. Eleven volunteers were

submitted to the ET consisting in 3 days a week, each session of 60 minutes during 6 months at moderate intensity (50% of heart rate reserve). Anthropometric parameters, blood pressure, NO_x- concentration were measured at initial time and after ET. A significant reduction in both systolic and diastolic blood pressure values was seen after ET which was accompanied by markedly increase of NO_x- levels (basal: 10 +/- 0.9; ET: 16 +/- 2 microM). Total cholesterol was significantly reduced (basal: 220 +/- 38 and ET: 178 +/- 22 mg/dl), whereas triglycerides levels were not modified after ET (basal: 141 +/- 89 and ET: 147 +/- 8 mg/dl). The study shows that changing in lifestyle promotes reduction of arterial pressure which was accompanied by increase in nitrite/nitrate concentration. Therefore, 6-months of exercise training are an important approach in management arterial hypertension and play a protective effect in postmenopausal women.

Giuseppe Cicero AF, et.al. (2009) evaluated the short-term cardiometabolic effect of a sequential physical activity programme on pharmacologically untreated hypertensive overweight women and on age-matched men. The study enrolled 80 overweight patients with newly diagnosed hypertension, not treated with antihypertensive nor antihyperlipidaemic drugs or under stabilized treatment. After 3 months of AHA Step 2 diet, they followed a sequential training programme including 56 days of added 3 metabolic equivalents (METs)/week and 56 days of 6 METs/week. Dietary habits, anthropometric measurements, blood pressure measurement, insulin-resistance profile and plasma lipids were monitored. All experienced a significant decrease in body mass index, waist circumference and blood pressure after both training,

but only women experienced an improvement in diastolic blood pressure at the end of the intensive training phase. However, when considering the single pre-specified subgroups, only women experienced a significant increase in high-density lipoprotein cholesterol (HDL-C). Older women without metabolic syndrome (MS) and older men with MS experienced a decrease of HDL-C following moderate intensity exercise and an increase after intensive exercise. While all patient subgroups experienced a significant reduction in homeostasis model assessment (HOMA) index only after the intensive exercise phase when compared with the baseline, women differently experienced a significant improvement in HOMA index just after the moderate exercise phase and a further improvement after the intensive one. On the basis of the data, it seems that the metabolic and haemodynamic answer of women to physical activity is particularly effective and different compared with men.

Volpe SL,et.al. (2008) investigated the effect of diet alone (D), exercise alone (E), and a combination of diet and exercise (DE) on body weight, body composition, energy intake, blood pressure, serum lipid and leptin levels, and fitness levels in mildly obese sedentary women and men. The three interventions were compared in a randomized longitudinal study design. The exercise programs were supervised for six months, after which participants in E and DE were provided with exercise equipment to take home. 90 adult overweight women and men (age: 44.2 +/- 7.2 years; BMI = 30.5 +/- 2.7 kg/m²). Body weight, body composition, waist and hip circumferences, blood pressure, serum lipid levels, and fitness levels were evaluated at 0, 3, 6, 9, and 12 months. Serum leptin concentrations were measured at 0 and 6 months only. At 6 and 9 months

in women, and 9 months in men, DE demonstrated a significant loss of body weight compared to both D and E ($p < 0.05$). Serum leptin levels significantly decreased from baseline to 6 months in women in D ($p = 0.05$) and DE ($p = 0.0003$) and men in E ($p = 0.038$). At one year, no significant differences existed among groups in any of the measures. A combination of diet and exercise resulted in a significant decrease in body weight in women and men; but this decrease was not maintained at one year follow-up. Serum leptin concentrations showed significant within-group decreases, but were not different among groups. A supervised diet and exercise program is effective for weight loss; however, once intensive participant-investigator and participant-participant contact is discontinued, weight regain ensues.

Savvas et.al. (2008) investigated the adaptations of a water-based training program as well as the detraining and retraining effects on physiological parameters in patients with coronary artery disease (CAD). Methods: Twenty-one patients were separated in an exercise group ($n = 11$) and a control group ($n = 10$). The exercise group followed three periods: training, detraining and retraining. Each period lasted 4 months. During the training and the retraining periods, the patients performed four sessions of water exercise (not swimming) per week. Results: The water-based program was well-accepted and no adverse effects were observed. The exercise group improved ($p < 0.05$) their stress-test time (+11.8%), VO_2 peak (+8.4%) and total body strength (+12.2%) after the training period; detraining tended to reverse these positive adaptations. Resumption of training increased the beneficial effects obtained after the initial training period (exercise stress: +4.5%; VO_2 peak: +6.6%; total strength: +7.0%).

The patients in the control group did not show any significant alterations throughout the study. Conclusion: Water-based exercise is safe and induces positive physiological and muscular adaptations in low-risk patients with CAD.

Starker, et.al. (2007) investigated the Motor Fitness Results of the German Health Interview and Examination Survey for Children and Adolescents (KiGGS). Motor fitness was investigated in children and adolescents aged 4-17 using specific short tests. These tested the motor abilities: co-ordination, strength, cardio respiratory fitness and flexibility. Among the 4-10 year olds, the focus of the investigation was on recording coordination, strength and flexibility; in the age group of the 11-17 year olds it was on recording cardio respiratory fitness. The current investigation describes motor fitness based on the tested abilities according to age, sex and socio-demographic aspects. In all the test tasks, as expected, there are better results from older children and adolescents than from younger ones. Among the 4-10 year olds, girls display a slightly higher motor fitness in five out of the six tasks. In cardio respiratory fitness, the cycle ergo meter test for the 11-17 year olds shows better results for boys. The results indicate that there is a correlation between migrant status, social status and motor fitness. The shown differences point out that possible intervention programmes should be specifically attuned to age and sex as well as to the concerns of children and families with a migrant background and those of low social status. These collected data on motor fitness produced a database, representative of Germany. This will enable statements on state and development of motor fitness in children and adolescents in the future.

Selvalakshmi (2007) conducted a study on effect of varied aerobic training program on obese women working in IT companies for the purpose of the study aerobic refers to a variety of exercise that stimulate heart and lung activity for a time period sufficiently long to produce beneficial changes in the body (Cooper, 1970). Aerobic is a system of exercises designed to promote the supply and use of oxygen in the body. In this study, the investigator is interested to carry out the experiment on two randomized groups of obese women working in IT companies and their effects on cardio respiratory functions. For this study, the obese women were grouped into three namely, control, floor aerobic and step aerobic group. The collected data on the cardio respiratory parameters prior to and after 12 weeks of varied aerobics training were statistically analyzed using Analysis of covariance (ANCOVA) as recommended by Clarke and Clarke (1972) Best and Khan (1986). And result on vital capacity showed significant improvement due to varied aerobic exercises, where as no significant improvement in resting heart rate.

Opper, et.al. (2007) studied the module "Motorik" in the German Health Interview and Examination Survey for Children and Adolescents (KiGGS). Motor fitness and physical activity of children and young people. Motor fitness and physical activity are important aspects of a healthy development in childhood and adolescence. However, the assessment of motor fitness and physical activity is not subject to standardized criteria; furthermore, the samples investigated do not provide a representative image of the whole population. Therefore, the existing data only allow very limited statements on the state and development of motor fitness and physical activity. The "Motorik" module, as part of the German

Health Interview and Examination Survey for Children and Adolescents (KiGGS), offers nationwide representative data on the motor fitness and physical activity of children and adolescents for the first time. Besides the baseline-analysis, another aim is to analyze the complex relationship between motor fitness, physical activity and health. Motor fitness, based on the systematization of motor abilities, was assessed using a test profile. The test profile consists of 11 items measuring cardio respiratory fitness, strength, coordination and mobility. Physical activity was assessed using a questionnaire containing 51 items on the duration, intensity and frequency of physical activity in everyday life, during leisure time, at school and in sports clubs. The above-mentioned questionnaire subtopics were supplemented by questions on the weekly prevalence of at least 60 minutes of daily physical activity, on material and local conditions, as well as on cognition and motivation for physical activity. In the years 2004 to 2006, the motor fitness and physical activity of 4,529 children and young people between the ages of 4 and 17 years was investigated on 168 sample points in the context of the "Motorik" module. Half of the children and adolescents investigated belong to the middle class; approximately 15% have a background of migration. The majority of the subjects come from small towns, about a quarter live in the city, and less than 20% are settled in rural areas.

García, et.al. (2007) studied the Lipid and metabolic profiles in adolescents are affected more by physical fitness than physical activity (AVENA study). To determine whether the level of physical activity or physical fitness (i.e., aerobic capacity and muscle strength) in Spanish adolescents influences lipid and metabolic profiles. From a total of 2859 Spanish adolescents (age 13.0-

18.5 years) taking part in the AVENA (Alimentación y Valoración del Estado Nutricional en Adolescentes) study, 460 (248 male, 212 female) were randomly selected for blood analysis. Their level of physical activity was determined by questionnaire. Aerobic capacity was assessed using the Course-Navette test. Muscle strength was evaluated using manual dynamometry, the long jump test, and the flexed arm hang test. A lipid-metabolic cardiovascular risk index was derived from the levels of triglycerides, low-density lipoprotein cholesterol (LDLC), high-density lipoprotein cholesterol (HDLC), and glucose. No relationship was found between the level of physical activity and lipid-metabolic index in either sex. In contrast, there was an inverse relationship between the lipid-metabolic index and aerobic capacity in males ($P=.003$) after adjustment for physical activity level and muscle strength. In females, a favorable lipid-metabolic index was associated with greater muscle strength ($P=.048$) after adjustment for aerobic capacity. These results indicate that, in adolescents, physical fitness, and not physical activity, is related to lipid and metabolic cardiovascular risk. Higher aerobic capacity in males and greater muscle strength in females were associated with lower lipid and metabolic risk factors for cardiovascular disease.

Baillie , Wyon and Head (2007) studied the physiological effects of performance in Highland-dance competition to consider whether the traditional methods used during class and rehearsal provide an appropriate training stimulus toward this performance. Nine championship standard, female Highland dancers (age 14.2 +/- 1.47 years) had their heart rate and blood lactate concentrations measured before and after 3 dances during a championship competition. Heart

rate was also measured during the same 3 dances in rehearsal and during class. Repeated-measures analysis of variance showed significant differences in predance lactate concentrations between the first dance (Highland Fling, 1.4 +/- 0.3 mM/L), the second dance (Sword dance, 2.3 +/- 0.8 mM/L), and the third dance (Sean Truibhas, 3.5 +/- 1.8 mM/L; $F_{2,16} = 11.72$, $P < .01$). This, coupled with a significant rise in lactate concentration during the dances ($F_{1,8} = 76.75$, $P < .001$), resulted in a final post dance lactate concentration of 7.3 +/- 2.96 mM/L. Heart-rate data during competition, rehearsal, and class (195.0 +/- 6.5, 172.6 +/- 5.4, and 151.9 +/- 7.4 beats/min, respectively) showed significant differences between all 3 ($F_{2,16} = 107.1$, $P < .001$); these are comparable to research on other dance forms. Given the disparity between the anaerobic predominance of competition and the aerobic predominance during class, it is suggested that the class does not provide an appropriate training stimulus as preparation for competitive performance in Highland dance.

Vaidya AK, et.al. (2006) studied the burden of obesity and its association with physical activity was carried out in a rapidly urbanizing town. A cross-sectional study to investigate the prevalence of obesity and its association with physical activity was carried out in one thousand adult males of Dharan municipality. Tools of data collection included interview and physical measurements such as blood pressure, height and weight measurements, and waist and hip circumferences. Odds ratios (ORs) and their 95% confidence intervals for obesity were computed across various demographic and other variables without adjusting and then adjusting for physical activity. The prevalence of overweight and obesity in the population was 32.9% and 7.2%

respectively. The study showed that physical inactivity is more importantly associated with obesity in the older population. The trend of young being more obese is reversed after adjusting for physical activity so that those in the older age were more obese than the younger ones. Similarly, those in to the business, vocational and clerical works, those who were more literate and those in the higher socio-economic status were significantly associated with obesity even after correcting for physical activity. The prevalence of overweight and obesity is high in the males of Dharan. The value and effect of physical activity seem to vary across different age-groups and socio-economic status and occupations. The young, the technical persons or businessmen and the more prosperous ones probably need to bring down their calorie intake along with emphasis on physical activity in order to bring down their weight and cardiovascular risk.

Takahashi , Ishihara and Aoki (2006) examined how the recovery of physiological functioning of the leg muscles after high-intensity eccentric exercise such as downhill running could be promoted by aqua exercise for a period until the damaged muscle had recovered almost completely. Ten male long-distance runners were divided equally into an aqua exercise group and a control group. From the first day (Day 0) to the fourth day (Day 3), the participants completed a questionnaire on muscle soreness, and serum creatine kinase activity, muscle power, flexibility, whole-body reaction time and muscle stiffness were measured. After measurements on Day 0, the participants performed downhill running (three 5 min runs with a 5 min rest interval at -10%, 335.7 +/- 6.1 m . min⁻¹). The aqua exercise group performed walking, jogging and jumping in water on three successive days following the downhill running on

Day 0 for 30 min each day. Muscle power was reduced on Day 1 in the control group ($P < 0.05$). Muscle soreness in the calf on Day 3 was greater in the control group than that in the aqua exercise group ($P < 0.05$). In the aqua exercise group, muscle stiffness in the calf was less than that in the control group over 4 days (time main effect: $P < 0.05$; group x time interaction: $P < 0.05$). We conclude that aqua exercise promoted physiological functioning of the muscles in the legs after high-intensity downhill running for a period until the damaged muscles had recovered almost completely.

Jay O, and White MD.(2006) studied for their potential influences on breath-holding ability. Maximum breath-hold time (BHTmax) was measured a total of 546 times in 13 males and 13 females, each repeating 3 trials of sudden face immersion (i.e., no prior hyperventilation) in water at 0, 5, 10, 15, 20, and 33 degrees C and in an air control condition (AIR). End-tidal carbon dioxide ($P(ET)CO_2$) and oxygen ($P(ET)O_2$) gas tensions were measured before and after breath-holding in a subset of 11 males and 11 females. For BHTmax there was no main effect of sex ($p = 0.20$), but there was a main effect of immersion condition ($p < 0.001$). Relative to pre-immersion rest values, end-tidal gas tensions were significantly higher in males than in females ($p \leq 0.05$) and significantly lower at decreased water temperatures relative to AIR ($p \leq 0.05$). In conclusion, for these matched groups (i) sex did not influence BHTmax; (ii) irrespective of sex, decreases in water temperature at 0, 5, 10, and 15 degrees C gave proportionate decreases of BHTmax; (iii) significantly greater deviations in both $P(ET)CO_2$ and $P(ET)O_2$ following breath-holding were evident in males relative to females; and (iv) irrespective of sex, there were significantly smaller

changes in both (PET)CO₂ and P(ET)O₂ at lower water temperatures relative to AIR, with or without removing the variance due to breath holding.

Torre, et.al. (2005) determined the cardiovascular responses during aerobic step dance using an overload strategy not yet investigated: appendicular overload. Ten healthy and moderately trained women (mean \pm -SD: age 27 \pm -3.4 years, height 167.8 \pm -4.6 cm, body mass 55.7 \pm -4.7 kg, body mass index 19.8 \pm -1.6, VO₂max 44.4 \pm -6.1 mL \times kg⁻¹min⁻¹) performed an incremental treadmill test to determine VO₂peak, the VO₂-heart rate (HR) and rating of perceived exertion (RPE)-HR relationships. Within 1 week from the laboratory test, the subjects performed two identical aerobic step dance routines: one using a track suit with loads placed in pockets close to the legs and arms and another without overload. The appendicular overload (10% of body mass) significantly increased the exercise intensity from 84.5% to 89.8% of HR_{max} corresponding to 68.9% and 78.3% of VO₂peak, respectively (P<0.01). Similarly, RPE increased from 12.1 to 15.7 (P<0.001). The estimated VO₂ and the caloric expenditure rose from 30.3 to 34.7 mL \times kg⁻¹min⁻¹ and from 251 to 288 kcal, respectively. This study shows that the use of appendicular overload significantly increases the energy cost of aerobic step session similarly to other overload strategies already reported in the literature.

Eckerson and Anderson (2004) examined the physiological response to water aerobics. Heart rate (HR) and oxygen uptake (VO₂) measured during water aerobics were compared to maximal values obtained during an incremental treadmill test to assess the energy demand and potential cardio respiratory

training effects of EA. Sixteen college age females served as subjects (mean \pm SD = 20.4 \pm 1.6 years). WA elicited a mean HR of 162 b.min⁻¹ and a mean VO₂ of 18.4 ml.kg⁻¹ which represented 74% of HR reserve, 82% of maximal HR, and 48% of VO₂ max. Average caloric expenditure was 5.7 kcal.min⁻¹. HR for WA were consistent with guidelines established by the American College Of Sports Medicine for developing and maintaining CR fitness in healthy adults. However, the VO₂ fell just below the recommended minimum threshold level. It was concluded that WA may provide an attractive alternative to traditional modes of exercise for improving CR fitness, however, HR measures may overestimate the metabolic intensity of the exercise.

Benelli, Ditroilo, Vito (2004) conducted a study on Physiological responses to fitness activities: A comparison between land-based and water aerobics exercise. This study compared the heart rate (HR) and blood lactate (BL) responses in young healthy women performing the same routine of aerobics exercise in 3 different conditions: on land, in shallow water (0.8 m), and in deep water (1.4 m). The average age and body mass index (BMI) of the group were 27.4 years and 22.6 kg.m⁻², respectively. The highest HR and BL values were reached during land aerobics (median HR values were 138.0 and 161.5 b.min⁻¹, and lactate values were 3.10 and 5.65 mmol.L⁻¹ at slow and at faster pace, respectively). These parameters were progressively reduced going from shallow water (121.5 and 154.0 b.min⁻¹, 1.75 and 3.15 mmol.L⁻¹) to deep water (97.5 and 113.5 b.min⁻¹, 1.70 and 1.75 mmol.L⁻¹). The HR measured as percentage of maximum HR varied from 48.43% to 77.53% depending on the water depth and

the pace. These data indicate that exercise in water significantly reduces HR and BL production compared with the same exercise performed on land.

Grier, et.al. (2002) examined the metabolic and cardiovascular responses of aerobic dance bench stepping (ADBS) at commonly used cadences and bench heights, 30 women (19-47 years of age) performed a graded maximal treadmill test and four 8-minute sub maximal ADBS routines. Subjects followed identical videotape sequences of basic ADBS movements at cadences of 125 and 130 beats.min(-1) at bench heights of 6 and 8 in. Physiological measurements were taken during each minute of each test. Mean values calculated from the last 3 minutes were used for data analysis. Although there were no physiological differences between ADBS at the 2 cadences, there were significant physiological differences between ADBS at the 2 bench heights. On average, a 2-in. increase in bench height, increased heart rate, VO₂, and rating of perceived exertion by 10 beats.min(-1), 3.09 ml.kg (-1) min(-1), and 1.53, respectively. In conclusion, it appears that bench height is more of a factor than cadence in increasing metabolic cost of ADBS. From this study provide information about the energy cost of ADBS at the common bench heights and cadences used in this study and, therefore, may be used to help aerobic participants select the proper bench height and cadence combination to control body weight and develop cardio respiratory fitness safely and effectively.

Laukkanen, et.al. (2001) measured heart rate during floor and step aerobic classes at three intensity levels. A group of 20 female occasional exercisers [mean age 33 (SD 8) years, mean body mass index 21 (SD 2) kg.m-2

volunteered to participate in six aerobic classes (three floor classes, three step classes) and in a laboratory test as members of one of two groups according to their prestudy regular participation in aerobics classes. Subjects in group A had participated four or more times a week and those of group B less than twice a week. The characteristics of the groups were as follows: group A, $n = 10$, mean maximal oxygen uptake (VO_{2max}) 38.7 (SD 3.6) $ml.kg^{-1}.min^{-1}$, mean maximal heart rate (HR_{max}) 183 (SD 8) $beats.min^{-1}$; group B, $n = 10$, VO_{2max} 36.1 (SD 3.6) $ml.kg^{-1}.min^{-1}$, HR_{max} 178 (SD 7) $beats.min^{-1}$. Each class consisted of a warm-up, a 20 min period of structured aerobic exercise (cardiophase) and a cool-down. The cardiophase was planned and guided as light, (rate of perceived exertion, RPE 11-12), moderate (RPE 13-14) or heavy (RPE 15-17) by an experienced instructor. The mean heart rates during the light classes were 72 (step) and 74 (floor) % HR_{max} in group A and 75 (step) and 79 (floor) % HR_{max} in group B; during the moderate classes, 84 (step) and 80 (floor) % HR_{max} in group A and 82 (step) and 83 (floor) % HR_{max} in group B, and during the heavy classes 89 (step and floor) % HR_{max} in group A and 88 (step) and 92 (floor) % HR_{max} in group B. Differences in heart rate and % HR_{max} were not statistically significant between the groups. However, differences in heart rate and % HR_{max} between the intensities (light vs moderate, moderate vs heavy and light vs heavy) were significant within both groups (all, $P < 0.01$). Based on the results, we conclude that intensity management during the aerobics classes was generally successful regardless of the participants' prior participation in aerobics.

Hayakawa, et.al. (2000) evaluated the effect of music on the mood of women during exercise. 16 middle-aged women, aged 49.9 ± 7.53 yr.,

performed 60-min. bench stepping exercise while listening to Japanese traditional folk song, aerobic dance music, or nonmusical. The subjects reported significantly less fatigue with aerobic dance music and Japanese traditional folk song than with nonmusic. Aerobic dance music was associated with significantly more vigor and less confusion than nonmusic.

Sanya AO, and Adesina AT. (1998) found the relationship between estimated body fat and respiratory function indices. Cross sectional study of volunteers in the physiotherapy department. Physiotherapy patients with no respiratory or neuromascular diseases. Quetelet index (as measure of body fat), vital capacity and breath holding time. Their ages ranged from 20 year to 60 years with a mean 24.20 ± 6.59 years and 29.72 ± 14.18 years in males and females respectively. Subjects whose quetelet index was about 30 kg/m^2 and above were classified as obese. None of the male subjects fell into the obese category, while six of the 50 female subjects fell into the obese category. Significant differences were observed in the mean of the Quetelet index, percent predicted vital capacity and the breath holding time between the normal female and the obese female subjects. A high but inverse relationship was found between estimated body fat and each percent predicted vital capacity and breath holding time in subjects whose Quetelet index was above 30 kg/m^2 . There was also a high and positive correlation between percent predicted vital capacity and breath holding time in subjects with Quetelet index above 30 kg/m^2 . These findings were attributed to the restrictive effect of excess adipose tissue located around the thorax and the abdomen. It was concluded that adequate caution should be taken

during exercise therapy for patients with a Quetelet index value above 30 kg/m² to enable them exercise safely and with respiratory efficiency.

Bushman, et.al. (1997) determined that four weeks of DWR had no impact on post-training sub maximal treadmill heart rate responses when compared to pre-training sub maximal values (pre = 158 ± 5.0 bpm; post = 158 ± 4.4 bpm). In contrast, after training subjects in shallow water. In shallow water running 1 meter deep (WR) Hamer and Morton found heart rates of sedentary subjects to be 10-12 bpm lower during sub maximal water running compared to treadmill running. Interestingly. The intensity of exercise increased towards VO₂max, the disparity of heart rate response between the two modes of exercise were diminished to within only a 5 bpm difference (50% VO₂max: WR 122 ± 8 , TM 134 ± 10 bpm; 90% VO₂max: WR 168 ± 11 bpm, TM 173 ± 8 bpm).

Wilber et al. (1996) exercised aerobically trained subjects 5 days a week, alternating high intensity shorter workouts (90-100% VO₂max for 30 minutes) with moderately intense longer sessions (70-75% VO₂max for 60 minutes). Similarly, Bushman et al. (1997) employed a training regimen consisting of DWR 5-6 days a week integrating two long and short interval days, one long run and an easy recovery run. These training schedules not only reflect actual training routines of these competitive athletes but more importantly insure adequate exercise intensity for the maintenance VO₂max. Only one published training study investigated the effects of DWR with older adults (mean age of controls 57.5 ± 2.3 yr, mean age of experimental group = 63.1 ± 1.6 yr). In this

investigation Long et al. (1996) reported significant VO₂max improvements in a group of 35 sedentary older women after a 10-week DWR program.

Morrow, Jensen and Peace (1996) divided 11 subjects into either DWR (female = 3, males = 3) or land-based (female = 2, male = 3) exercise groups. Subjects trained three days a week for 35 minutes a session at 80% of HR_{max} as determined by mode specific VO₂max tests. Additionally, subjects performed a timed 2.4-k run. Both training groups significantly improved in VO₂max ($p < 0.01$). DWR training also decreased run time ($p = 0.06$). No mode specific differences between the two training methods (land vs. water) were observed indicating that DWR can improve VO₂max in a similar fashion as land-based exercise.

Gottlieb-Vedi M et.al. (1995) determined if training with short intervals at the velocity producing a lactate level of 4 mmol/l (VLA4) is sufficient to induce adaptations and better exercise tolerance. Five Standardbred mares (4-8 years) were interval trained on a treadmill 3 days a week for 12 weeks and subsequently detrained for 4 weeks. Standardized exercise tests were performed before, during and after the training period and muscle biopsies were taken. Measurements were made of heart rate, oxygen consumption, stride frequency, blood volume and blood lactate. Plasma volume was reduced after 2 weeks of training but then increased to the approximate pre-training value throughout the remaining training and post-training periods. No change was detected in the total cell volume whereas the total blood volume varied in consequence with the plasma volume variation. A significant reduction in heart rate response to

exercise was seen after 4 weeks of training. VLA4 increased after 2 weeks of training and remained higher than the baseline value during the rest of the training period. Consequently, the blood lactate at 8 m/sec was decreased compared to baseline concentration after 8 and 12 weeks of training. The post-training VLA4 did not differ significantly either from the end of training or from the pre-training value. Mass specific oxygen consumption (VO_2 -200/BW) at V200 increased with training and decreased with detraining. The respiratory quotient at a velocity of 8 m/sec decreased from 1.18 ± 0.02 before training to 1.07 ± 0.02 ($P < 0.05$) at the end of training. No changes were found in muscle histo- or biochemical parameters. The results indicate that training at VLA4 is sufficient to cause adaptational changes in exercise tolerance related parameters.

Quinn and colleagues (1994) found that untrained females were unable to sustain VO_2 max though DWR. In their study, 7 young untrained females (mean = 21.7 yr) performed 6 weeks of land-based training (LBT) followed by 4 weeks of DWR. Evaluation of VO_2 max occurred on three separate occasions: before and after the land-based running training and at the conclusion of the DWR program. Participants trained 4 days a week for duration of 30 minutes per day. Untrained subjects improved VO_2 max after 6 weeks of outdoor running (post-LBT = 42.9 ± 3.2 ml/kg/min) only to have these gains return to pre-training baseline values after 4 weeks of DWR (pre-training = 39.9 ± 3.6 , post-DWR 40.0 ± 1.8 ml/kg/min)

Bell and Bassey (1994) compared the oxygen uptake and heart rate in various styles of dance and in a graded step test in ten healthy women aged

[mean (SD)] 34 (5) years. Dance was choreographed into progressively more energetic sequences typical of community classes, and videotaped. Oxygen uptake was assessed using a respirometer carried in a back-pack. Each of the two tests (dance and step) took 15-20 min and measurements were made in randomised balanced order on the same day. The mean oxygen costs of dance ranged from 1.29 l.min⁻¹ for low impact style to 1.83 l.min⁻¹ for high impact style with arm work; mean heart rates were 135 and 174 beats.min⁻¹ respectively. Low impact dance raised heart rates above 60% of predicted maximum and so would provide training; during high impact dance recorded heart rates sometimes exceeded recommended safe limits. The addition of arm work significantly increased heart rates in both high and low impact dance but when oxygen pulses for each style of dance were compared no significant differences attributable to arm work were found. Moreover calculated differences between oxygen uptakes in stepping and dance at the same heart rates (those recorded during dance) were not significant for any of the four styles. Analysis of variance confirmed that neither arm work nor impact contributed significantly to the differences, so there was no evidence that these forms of dance change the normal relation between heart rate and oxygen uptake found in dynamic activities with large muscle groups such as stepping.

Hoeger et al. (1992) directly examined the training effects of an identical aerobics program performed on land (low-impact) and in the water. Forty-nine untrained female subjects (water n = 20; land n= 15; control n = 14) participated in the 8-week study with the experimental groups exercising 3 times per week. The aerobic portion of the training session was 20 minutes in duration with

exercise intensity maintained between 70-85% of HRR. Both the land-based (low-impact) and shallow water aerobics groups made similar gains in aerobic fitness, with a 14.8% relative improvement in estimated VO₂max using a Bruce protocol (pre = 31 ± 6.8 , post = 35.6 ± 7.0 ml/kg/min) observed in the shallow water aerobics group. Total treadmill time was also significantly increased (by one minute) following shallow water training. In agreement with Hoeger et al., a smaller yet significant 5.6% increase in VO₂max (34.8 ± 4.1 to 36.7 ± 5.2 ml/kg/min) and an improved run time to exhaustion (pre = 15.8 ± 3.7 min, post = 19.4 ± 5.0 min) was also observed by Abraham (1994) following eleven weeks of shallow water aerobics.

Hertler et al. (1992) compared treadmill exercise to deep water running (DWR) training in 13 young runners (aged 18-26 yr). Subjects trained on land 3 days per week, for 4 weeks, and then half of the subjects began a DWR program while the rest continued to run on land. To equalize the training, groups were matched for total exercise time and RPE. Post-training maximal treadmill tests indicated no changes occurred in VO₂max between the treadmill and DWR exercise training groups. This finding implies that DWR training can be effective in maintaining VO₂max in aerobically trained subjects.

2.5 STUDIES ON BIOCHEMICAL VARIABLES

Taralov et al., (2000) found that the physical activity had a beneficial effect on the serum lipid profile in adolescent and mature human. For this study 876 highly trained athletes (559 boys and 317 girls) with their mean age, weight and duration of training, 14.01 years, 56.24 kg, and 3.52 years respectively were

used. The control group consisted of 357 untrained subjects (171 boys and 186 girls) with mean age and weight 14.58 years and 57.75 kg, respectively. The athletes were divided into seven subgroups according to the sport practiced with 105 athletes, 107 swimmers, 233 rowers and 225 wrestlers, boxers and judos, 47 weight lifters, 92 from members of various team sports and 67 from other sports. Venous blood samples were drawn from the cubital vein and the concentrations of serum total cholesterol, HDL-cholesterol and triglycerides were measured. The results of the study indicated that a) trained pubescents had lower serum total cholesterol than untrained boys and girls of the same age; b) trained pubescent boys had lower serum total cholesterol than trained pubescent girls; c) the level of serum triglycerides was not relevant to the type of physical exercise in pubescence; d) long-term sport practicing was not able to decrease serum HDL - cholesterol levels in both sexes; e) sport affected serum total cholesterol to a greater degree than sex in pubescence.

Kristiansen et al., (2000) subjected eight untrained subjects to endurance training with one thigh for three weeks using a knee-extenso ergometer. They were then subjected to two-legged glycogen depleting exercise and were given carbohydrate free meal thereafter to keep muscle glycogen concentration low. The next morning, dynamic knee extensions with both the thighs simultaneously at 60, 80 and until exhaustion at 100 per cent of each thigh peak workload was performed. Glucose uptake was similar in both thighs during exercise at 60 per cent of the thigh peak work load. At the end of 80 and 100 percent of peak work load, glucose uptake was on an average 33 and 22 percent higher, respectively, in trained compared with untrained muscle. Training increased the muscle content

of glucose transporters (GLUT- 4) by 66 per cent. At exhaustion, glucose extraction correlated significantly with total muscle GLUT- 4 protein. Thus, when working at a high load with low glycogen concentrations, muscle glucose up take was significantly higher in trained than in untrained muscle. This may be due to the higher GLUT- 4 protein concentration in trained muscle.

Katzel et al., (1997) documented the sequential effects of aerobic exercise training and weight loss on risk factors for coronary disease in healthy, obese, middle aged men and older men. The effects of sequential interventions of 9 month of aerobic exercise training (AEX) followed by weight loss (WL) with continued AEX (AEX+WL) in cardiac risk factors in 21 obese middle aged and older men were examined. The results indicated that AEX increases VO_2 max of these men by 14% ($p<0.001$) with no significant change in weight. Also AEX did not improve BP or oral glucose tolerance and had no significant effect on lipid concentrations. During the AEX + WL intervention, 21 men lost 8.1 ± 0.6 kg compared with AEX, AEX + WL group decreased glucose and insulin responses during the oral glucose tolerance test by 8% ($p<0.05$) and 30% ($p<0.01$) respectively. AEX + WL reduced plasma triglycerides by 17% ($p<0.05$) and LDL-C by 8% ($p<0.01$) and increases HDL-C by 11% ($p<0.01$). The sequential interventions resulted in a 20% decreased in the LDL –C /HDL-C ratio. The results denoted that AEX + WL had a more substantial impact than AEX alone on glucose tolerance and lipoprotein concentrations.

El-Sayed and Rattu, (1996) studied the effect of prolonged submaximal exercise followed by a self-paced maximal performance test on total cholesterol,

triglycerides and high density lipoprotein cholesterol in nine trained athletes. Venous blood samples were obtained at rest, at 30 and 60 minutes during submaximal exercise and immediately after the performance test. Lactic acid, Hematocrit (Hct), Hemoglobin (Hb), total cholesterol and triglycerides were measured in the blood, while plasma was assayed for HDL-cholesterol. Plasma volume changes in response to exercise were calculated from Hct and Hb values and all lipid measurements were corrected accordingly. In order to ascertain the repeatability of lipid responses to exercise, all subjects were re-tested under identical testing conditions and experimental protocols. The data obtained during the two exercise trials were analysed by two-way ANOVA and no significant differences between tests were obtained. Consequently, the data was analysed by one-way ANOVA. Blood lactic acid increased nonsignificantly during the prolonged submaximal test, but rose markedly following the performance ride. Lipid variables ascertained at rest were within the normal range for healthy subjects. ANOVA showed that blood total cholesterol and triglycerides were unchanged whereas HDL-cholesterol rose significantly in response to exercise. Post hoc analysis indicated that the latter change was due to a significant rise in HDL cholesterol after the performance ride. It was concluded that apparent favourable changes in lipid profile variables occur in response to prolonged submaximal exercise followed by maximal effort and these changes showed a good level of agreement over the two testing occasions.

Giada et al., (1996) studied the lipoprotein profile, diet and body composition in twenty professional soccer players (mixed trained), twenty body builders (anaerobic trained) and twenty sedentary subjects, all males of similar

age. No significant differences in total serum cholesterol, triglycerides, HDL - cholesterol, LDL - cholesterol, apolipoprotein A-I, A-II, B, C-II, C-III, and E levels were found among the groups studied. Bioelectrical impedance analysis disclosed significantly lower body fat percentages in both groups of athletes and increased fat free mass only in body builders. Daily calorie intake was higher and alcohol intake was lower in the athletes, compared with controls. Body builders had lower carbohydrate and higher protein and cholesterol intakes, while soccer players had a lower polyunsaturated to saturated fat ratio. None of the apolipoproteins examined was correlated with any body composition or diet parameters. No correlations between lipid parameters and anthropometric or dietary variables were found by multivariate analysis when the subjects were considered as a whole.

Tegeiman et al., (1996) reported that the physical training affects carbohydrate metabolism and resulted in an increased insulin - stimulated glucose disposal. The present study was conducted to investigate whether carbohydrate and lipid metabolism would be affected by nutritional factors in optimally trained elite ice-hockey players on two Swedish top-performance teams. Players on one team were subjected to extensive dietary monitoring and intervention, whereas players on the second team continued their ordinary diet. Blood levels of insulin, C-peptide, glucose, hemoglobin A1c, lipids and lipoproteins were measured repeatedly. Basal insulin levels and insulin resistance were significantly lower among athletes on both the teams compared with a sedentary group and muscle weight and body mass index were significantly higher. Exercise increases glucose utilisation by muscle, depending upon the

mode, intensity and duration of the exercise. Exercise would also increase insulin sensitivity of the tissues, thereby increasing glucose uptake and utilisation.

Giada et al., (1995) examined 12 older and 12 young adult male cyclists first at the peak of their seasonal preparation and then again two months after its suspension. Sedentary males matched for age, weight and height comprised the respective control groups. During training, the body fat mass was significantly lower and maximum oxygen consumption (V_{O_2} max) was higher in both groups of cyclists as compared with controls. No differences in serum total cholesterol, low density lipoprotein cholesterol, apolipoprotein (apo) B, apo A-II, and fibrinogen were found. During the same phase, triglycerides and LDL-cholesterol to high density lipoprotein cholesterol ratio were significantly lower and apo A-I, HDL-cholesterol, HDL-3-cholesterol and the apo A1/apo B ratio were significantly higher in the athletes than their corresponding sedentary controls.

Lamon-Fava et al., (1989) studied the effect of an endurance triathlon (2.4 mile swim, 112-mile bicycle ride, 26.2 mile run in succession) on plasma total cholesterol, triglyceride, high density lipoprotein (HDL) cholesterol, low density lipoprotein (LDL) cholesterol, apolipoprotein (apo) A-I and B levels, and LDL particle size in 34 male and six female participants, six to twelve hours before and immediately after the completion of the triathlon. A significant decrease was noticed in plasma triglyceride (70%) and plasma apo B levels in both men and women. A significant increase was noticed in HDL cholesterol in both men (18% increase) and women (5% increase). Plasma triglyceride and LDL cholesterol did not change significantly in male athletes but decreased significantly in women. In men increase in HDL cholesterol was inversely

correlated with the decrease in triglycerides significance. These results indicated that prolonged strenuous physical exercise can induce acute modification of plasma lipoproteins, which may in part be related to enhanced lipolysis.

Hong and Lien, (1984) studied 11 men and five women athletes averaging 21 years of age, before and after four weeks of daily exhaustive exercise (six days a week) during an endurance training course. In comparing blood chemistries before and after training, concentrations of blood glucose, total serum lipids, serum triglycerides and serum cholesterol were significantly reduced; serum free fatty acid level was significantly increased and serum protein and serum phospholipid concentrations remained unchanged. It was concluded that exhaustive training produces reduced blood glucose but not clinically significant hypo glycemia with increased fat utilisation as a result of depletion of carbohydrate storage. Such training reduces the resting levels of serum cholesterol and serum triglycerides.

Higuchi et al., (1984) conducted a four week training programme for five healthy and mildly active males aged 28 to 31 years. They ran on a treadmill at 140 to 160 m/min at 0% grade for 50 min, five times a week, equivalent to an energy expenditure of 9 kg cal/kg body weight/day. They maintained their body weights by increasing calorie intake to match increased energy expenditure. No changes were observed in mean body weight, skinfold thickness, basal metabolism and maximal oxygen uptake after the training programme. However, the exercise training did not induce changes in plasma total cholesterol and triglyceride levels.

2.6 STUDIES ON PSYCHOLOGICAL VARIABLES

Van der Gucht E, et.al.(2009) examined depressogenic psychological processes and reward responsivity in relation to different mood episodes (mania, depression, remission) and bipolar symptomatology. One hundred and seven individuals with bipolar disorder (34 in a manic/hypomanic or mixed affective state; 30 in a depressed state and 43 who were euthymic) and 41 healthy controls were interviewed with Structured Clinical Interview for DSM-IV and completed a battery of self-rated and experimental measures assessing negative cognitive styles, coping response to negative affect, self-esteem stability and reward responsiveness. Individuals in all episodes differed from controls on most depression-related and reward responsivity measures. However, correlational analyses revealed clear relationships between negative cognitive styles and depressive symptoms, and reward responsivity and manic symptoms. Separate psychological processes are implicated in depression and mania, but cognitive vulnerability to depression is evident even in patients who are euthymic.

Mullen R, Lane A, and Hanton S. (2009) examined the intensity and direction of the competitive state anxiety response in collegiate athletes as a function of four different coping styles: high-anxious, defensive high-anxious, low-anxious and repressors. Specifically, the study predicted that repressors would interpret competitive state anxiety symptoms as more facilitative compared to high-anxious, defensive high-anxious, and low-anxious performers. Separate Multivariate Analyses of Variance (MANOVA) were performed on the intensity and direction subscales of the modified Competitive State Anxiety

Inventory-2 (CSAI-2). A significant main effect was identified for trait worry revealing that low trait anxious athletes reported lower intensities of cognitive and somatic anxiety and higher self-confidence and interpreted these as more facilitative than high trait anxious athletes. The prediction that performers with a repressive coping style would interpret state anxiety symptoms as more facilitative than performers with non-repressive coping styles was not supported.

Edwards B, and Higgins DJ.(2009) compare the mental health and vitality of people caring for a family member with a disability with those of the general population. Second, to identify factors experienced by carers that put them at risk of poor mental health and vitality. Cross-sectional design where logistic and multiple regression analyses were used to compare rates of mental health problems and vitality between careers and the general population while controlling for demographic characteristics. In addition, logistic and multiple regression using data from the survey of careers were used to identify risk factors for poor mental health and vitality that were particular to care giving. A randomly selected representative survey of 1002 careers from the Australian Centre link administrative database (June 2006) who received government payments to care for a person with a disability or severe medical condition, or a person who was frail aged. A sample of 10 223 non-careers was drawn from the fourth wave of the Household, Income and Labor Dynamics in Australia Survey, a nationally representative household panel survey (August 2004 to February 2005). Mental health and vitality as measured by the Medical Outcomes Study 36-item Short-Form Health Survey. Compared with the general population, careers were at significantly greater risk of having a mental health problem and

lower levels of vitality, even after controlling for demographic characteristics. For careers, the risk factors for poor mental health and lower levels of vitality were caring for a person with a disability with higher care needs, experiencing greater levels of financial stress, lower levels of support and worse family functioning. Careers are at greater risk of mental health problems and lower energy levels than the general population.

Barnow S, et. al. (2009) reported that the cognitive theory of personality disorders hypothesizes that the emotional dysregulation and interpersonal problems in individuals with borderline personality disorder (BPD) are, at least partially, caused by dysfunctional cognitive schemas. These schemas lead to biased evaluation of environmental and interpersonal stimuli. This study examined the interpersonal evaluations of individuals with BPD, depressive and healthy control participants with the thin-slice judgments paradigm. Participants were asked to evaluate six persons in six film clips, which showed these persons for 10s, during which these persons entered a room and took a seat. Interpersonal style of the BPD group was investigated with the Inventory of Interpersonal Problems (IIP-C) questionnaire. Individuals with BPD judged the persons as being more negative and aggressive and less positive than the healthy participants, and more aggressive than the depressive individuals. In addition, individuals with BPD reported more extreme interpersonal behavior relative to the controls. The findings indicate an aggressivistic evaluation bias and elevated levels of interpersonal problems in individuals with BPD as suggested in the cognitive theory.

Kercher A, and Rapee RM.(2009) study evaluates a pathway for depressive risk that integrates cognitive diathesis-stress and stress-generation theories, following Hankin and Abramson's (2001, *Journal of Clinical Child and Adolescent Psychology*, 31(4), 491-504) elaborated cognitive-diathesis transactional stress model. In this model, young adolescents with initial depressive symptoms were hypothesised to experience later stressors that were at least partly dependent on their behaviour. The interaction of cognitive vulnerability, a tendency to make depressogenic attributions and to ruminate, with these dependent stressors was then hypothesised to predict depressive symptoms after 6 months. This model was supported in a sample of 756 young adolescents, with cognitive style and dependent stressors partly mediating the relationship between initial and subsequent depressive symptoms. Cognitive vulnerability was also linked with an increased likelihood of dependent stressors.

Stine-Morrow EA, et.al.(2008) studied on cognitive training have suggested that the effects of experience are narrow in augmenting or maintaining cognitive abilities, while correlational studies report a wide range of benefits of an engaged lifestyle, including increased longevity, resistance to dementia, and enhanced cognitive flexibility. The latter class of evidence is ambiguous because it is possible that it is simply the case that those with relatively better cognitive vitality seek out and maintain a wider range of activities. The authors report data from a field experiment in which older adults were randomly assigned to participate in a program intended to operationalize an engaged lifestyle, built on a team-based competition in ill-defined problem solving. Relative to controls, experimental participants showed positive change in a composite measure of

fluid ability from pretest to posttest. This study, thus, provides experimental evidence for the proposition that engagement, in the absence of specific ability training, can mitigate age-related cognitive declines in fluid ability.

Von Guenther S, and Hammermeister J. (2007) explored the relationship between wellness and athletic performance, this study assessed the link between wellness, as defined by a high score on five wellness dimensions of emotional, social, spiritual, intellectual, and physical well-being, with psychological variables thought to be related to athletic performance as measured by athletes' self-report of specific athletic coping skills. 142 collegiate athletes completed a survey composed of the Optimal Living Profile to measure wellness dimensions and the Athletic Coping Skills Inventory to measure specific psychological variables. Analysis indicated that athletes scoring higher on the dimensions of wellness also scored significantly higher on athletic coping skills. Specifically, male athletes who scored higher on wellness also reported higher scores on coach ability, concentration, goal setting/mental preparation, and peaking under pressure, and female athletes who scored higher on wellness also reported higher scores in coping with adversity, coach ability, concentration, goal setting/mental preparation, and freedom from worry. Various dimensions of wellness seem related to better performance by involving the athletic coping skills of intercollegiate athletes. Implications for coaches and sport psychologists are also discussed.

Carr CM.(2006) highlighted the area of sport psychology as it relates to performance psychology skills (mental training), including a historical overview

and current topics overview. The use of mental training skills may be of interest to the practicing physical medicine and rehabilitation professional in the treatment of his or her patients. It is important that the physical medicine professional recognize what sport or performance psychology represents within the paradigm of psychological interventions. Referring to an individual based on his or her training (licensed psychologist versus mental training consultant) is essential for the appropriate management of psychological issues related to performance. The issues related to the psychological rehabilitation of the injured athlete are of importance to the medical staff; the overview of affective responses can assist in understanding the normal and adaptive responses of the injured athlete. Finally, a brief description of a psychologist's role within a sports medicine and rehabilitation practice is presented. The psychological issues that are present in the world of sport and elite performance are numerous, and not all are mentioned in this article. Issues of eating disorders, substance abuse, and psychological health with athletes should be further explored within the physical medicine and rehabilitation discipline as well as in the sports medicine discipline. The ever-evolving psychological dynamics of individuals involved in sport and elite performance are intriguing and unique. A specialized knowledge base, training, and experience in providing psychological services are required to treat this unique population. Counseling and clinical issues of the athlete and elite performer require further attention in the realm of psychological interventions, including further exploration of the efficacy of interventions for performance enhancement. The field of applied sport psychology may offer the physical medicine professional a unique perspective into the care of patients who are athletes and elite performers.

Buckworth and Dishman's (2002) review of the related literature concluded that positive associations between exercise and self esteem have been found, but effects are stronger for individuals initially lower in self esteem and the exercise has more potent effect on physical self concept and self esteem than on general self perceptions. Exercise induces a sense of competence and person's physical characteristics. Positive self esteem is associated with good mental health. So linking exercises with improvement in physical self concept and with better self esteem offers another reason for adopting and maintaining a physically active lifestyle.

Wininger (2002) examined the anxiolytic (anxiety reducing) effects of exercise for elderly women engaging in a single bout of aqua aerobics. Volunteers (N=29) completed questionnaires immediately before and after participating in an aqua aerobics class. The average age of participants was 66.4 yr. A brief form of Spielberger's State Anxiety Inventory and a questionnaire on demographic items were administered prior to engagement in exercise, and the brief form of the State Anxiety Inventory was administered again immediately after the exercise session. There was a significant difference on a t test between participants' ratings of anxiety before exercise (M = 16.8) compared to after exercise (M= 13.9); participants' ratings of state anxiety were somewhat lower after exercising. Weaknesses of the present study and suggestions for research are presented.

Wilson J.R. et.al. (2001) examined the effects on mood of two bouts of maximal aerobic exercise (Bruce and Ramp protocols) and one bout of anaerobic

exercise (Wingate Test) was evaluated in college aged males. Mood was measured with the Activation De-Activation Adjectival Check List (AD-ACL). Physiological measures showed that the two aerobic protocols were similar. Pre and post exercise mood changed significantly in each exercise test in a similar manner. And it was concluded that the pre and post exercise mood is altered after maximal aerobic and anaerobic exercises.

Berger and Motl (2000) conducted a study on recent 25 years reviews of related research literature to the effect of exercise on Profile of Mood States (POMS). They concluded that there is unequivocal support for the mood enhancing effects of exercise, specifically on improved vigor and reduced tension, depression, anger, confusion and fatigue. With respect to exercise intensity, the authors recommend that unless a participant prefers low or high exercise intensity, optimal conditions for mood changes occur at a moderate intensity level. In summary, exercise, in particular moderate intensity aerobic exercise, reduced negative mood and improved positive mood state.

Anies (1998) studied the effect of exercise on mood states of sedentary females. 66 female students of All Saints College, Trivandrum participated in this study. Mood states was first induced by POMS questionnaire and responses were collected prior to the training programme and the same questionnaire was administered after the exercise programme of a total of 12 sessions extending over a period of 4 weeks having 3 sessions per week with a duration of 45 minutes. Mood states was measured using POMS questionnaire before and after exercise. Results showed significant difference between pre test and post test

where the sedentary female have positive influence upon their mood states due to the exercise programme given.

Berger, Owen and Man (1993) determined the exercise and mental health literature and then examined the influence of rational difference on the acute mood benefits of swimming on women college students (N=70) from Czechoslovakia and the United States. They completed the POMS before and after class on three occasions. The United States swimming classes met for 50 minutes twice a week through out a 14 weeks semester Czechoslovakian swimming classes met for 90 minutes once a week throughout a biweek semester in comparison with their respective controls. Czechoslovakian swimmers reported greater mood changes than the United States swimmers. The Czechoslovakian and United States swimmers reported mood improvement on tension, depression, anger, vigor and confusion.

Stratton (1990) conducted a study to examine changes in mood states of college cross country runners across a competitive season. Also compare the mood state profiles of the men's team and the women's team. The POMS questionnaire was administered to the athletes every other week on Wednesday afternoon prior to practice throughout the season. Significant variations were identified for both the teams. Result reveals that the fatigue score for the females was higher than that for the males.

Berger and David (1988) experimented stress reduction and mood enhancement in four exercise modes, swimming, body conditioning, hatha yoga and fencing. Students voluntarily enrolled in co-educational fencing, body

conditioning, swimming and yoga administered the POMS, a measure of mood states and the state anxiety subscale of the STM before and after class on three different days, students were significantly more fatigued than before. In body conditioning, the interaction between pre and post means was significant. Yoga participants felt significantly better after exercising on four POMS subscales.

Phol (1984) assessed the effect of a 12 week aerobic dance class on body image, self esteem and fitness in female college students. 119 female college students participated in this study, 43 of those in the experimental group and the 76 to the control group. Self images were assessed using Journard's Self Catherseis Scales and Fitness were assessed using Cooper's 12 min run. Body image, self image and fitness were assessed on a pre test, post test basis with a minimum time between testing occasions of 12 weeks for all sessions. There is a positive and moderate correlation between body and self image.

2.7 SUMMARY OF LITERATURE

Tsourlou, et.al. (2006) examined the effectiveness of both aerobic and resistance components and found these as an alternative training method for improving neuromuscular and functional fitness performance in healthy elderly women.

Viskić, et.al.(2007) analyzed the impact of special programmed physical education including dance, aerobics and rhythmic gymnastics on the development of motor and functional abilities and found significant development of coordination/agility and specific rhythm coordination, functional aerobic ability, repetitive and explosive strength and flexibility, along with significant reduction of overweight and adipose tissue.

Obert, P. et.al. (2001) found aerobic training programme developed on the maximal power among prepubertal boys and girls. **Kraemer et.al. (2001)** found bench-step aerobics which enhances body composition, aerobic fitness, muscular strength, endurance, power.

Lewis (2005) observed improvements in submaximal heart and respiration rates, aerobic performance, muscle strength and endurance, gross motor skills, and anaerobic power due a home exercise program of combined aerobic and strength training. **Scharff et al (1997)** bench-step aerobics: exercise increases in the production of vertical impact force across other step heights at the faster speed.

Benelli, Ditroilo, and Vito (2004) compared between land-based and water aerobics exercise and found. that exercise in water significantly reduces heart rate and blood lactate production compared with the same exercise performed on land.

Hoeger et al. (1992) examined the training effects of an identical aerobics program performed on land (low-impact) and in the water and found both the land-based (low-impact) and shallow water aerobics groups made similar gains in aerobic fitness

Engles, et.al. (1998) examined the effects of low-impact, moderate-intensity exercise training with and without wrist weights. . They found that the use of light wrist weights has sufficient stimulus to augment aerobic fitness, beneficially affects leg strength, and increases feelings of vigor in older adults.

Gappmaier, et.al. (2006) examined the aerobic exercise in water versus walking on land. They indicated that there were no differences in the effect of aerobic activities in the water versus weight-bearing aerobic exercise on land on body composition components as long as similar intensity, duration and frequency are used.

Burgess, Grogan and Burwitz (2006) found aerobic dance significantly reduced body image dissatisfaction (Attractiveness, Feeling Fat, Saliency and Strength and Fitness) and enhanced physical self-perceptions (Body Attractiveness and Physical Self-Worth).

Laukkanen, et.al. (2001) measured heart rate during floor and step aerobic classes at three intensity levels and found differences in heart rate and %HRmax between the intensities (light vs moderate, moderate vs heavy and light vs heavy) were significant within both groups (all, $P < 0.01$).

Torre, et.al. (2005) found aerobic step dance using an overload strategy significantly increased HR max and VO_2 max. Grier, et.al. (2002) examined the metabolic and cardiovascular responses of aerobic dance bench stepping and found bench height is more of a factor than cadence in increasing metabolic cost.

Zaros PR, et.al. (2009) found exercise training are an important approach in management arterial hypertension and play a protective effect in postmenopausal women. **Giuseppe Cicero AF, et.al. (2009)** found a significant decrease in body mass index, waist circumference and blood pressure after training among obese men and women.

Hayakawa, et.al. (2000) found aerobic dance music was associated with significantly more vigor and less confusion than nonmusic. **Frangolias Rhodes, and Taunton (1996)** compared the cardiovascular responses of maximal deep water running to treadmill running. The researchers concluded that the more familiar individuals are with deep water running, the more closely matched the physiological responses of the two exercise mediums.

Eckerson and Anderson (2004) examined the physiological response to water aerobics and found that water aerobics may provide an attractive alternative to traditional modes of exercise for improving cardio respiratory fitness.

Selvalakshmi (2007) conducted a study on effect of varied aerobic training program on obese women and found vital capacity showed significant improvement due to varied aerobic exercises, where as no significant improvement in resting heart rate.

Kim (2001) studied the effect of aerobic exercise on hormones, blood lipids and body composition in middle aged obese women and found the level of HDL-C in the VG and NG groups was significantly higher than that of CG group. TC, TG and body weight between groups were not significant.

Katzel et al., (1997) documented effects of aerobic exercise training and weight loss on risk factors for coronary disease in healthy, obese, middle aged men and older men and found sequential interventions resulted in a 20% decreased in the LDL -C /HDL-C ratio.

Sasaki et al., (1987) conducted a study to find out if a long term aerobic exercise programme decreases the obesity index and increases the high density lipoprotein cholesterol concentration in obese children and concluded that a long term supervised aerobic exercise programme in obese children is beneficial and resulted in significant weight reduction with concomitant improvement of lipoprotein metabolism.

Wininger (2002) found that there was a significant difference on state anxiety after exercising. **Wilson J.R. et.al. (2001)** concluded that the pre and post exercise mood is altered after maximal aerobic and anaerobic exercises.

Phol (1984) found aerobic dance class affect on body image, self esteem and fitness in female college students. **Berger and David (1988)** found significant differences in stress reduction and mood enhancement in four exercise modes.

Berger, Owen and Man (1993) reported swimmers had mood improvement on tension, depression, anger, vigor and confusion. **Anies (1998)** found exercise affects favourably on mood states of sedentary females.

Berger and Motl (2000) reported that exercise, in particular moderate intensity aerobic exercise, reduced negative mood and improved positive mood state

Buckworth and Dishman's (2002) review of the related literature concluded that positive associations between exercise and self esteem. **Kercher A, and Rapee RM.(2009)** found cognitive vulnerability was also linked with an increased likelihood of dependent stressors.

Van der Gucht E, et.al.(2009) revealed clear relationships between negative cognitive styles and depressive symptoms. **Stine-Morrow EA, et.al.(2008)** found in the absence of specific ability training, can mitigate age-related cognitive declines in fluid ability.

Von Guenther S, and Hammermeister J. (2007) found emotional, social, spiritual, intellectual, and physical well-being were related to better performance by involving the athletic coping skills of intercollegiate athletes.

Carr CM.(2006) highlighted the area of sport psychology as it relates to performance psychology skills (mental training). **Edwards B, and Higgins DJ.(2009)** found Careers are at greater risk of mental health problems and lower energy levels than the general population.

Above literature shows that there was significant change in physical, physiological biochemical and psychological variables due to varied aerobics exercises. From the review of related literature it was found there was scope for research in finding out the effect of varied aerobics exercises on selected physical, physiological biochemical and psychological variables among the obese engineering college students.

Based on the experience gained, the investigator formulated suitable methodology to be adapted in this research, which is presented in Chapter III.