CHAPTER-II

REVIEW OF RELATED LITERATURE

The review of literature is instrumental in the selection of the topic, formation 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 review of literature is instrumental in the formation of hypotheses and to get a full picture of what is done with regard to the problem under study. Such a review brings about a deep and clear perspective of the overall field. Now a day the educational program of any type is characterized by reforms and innovative ideas. It seems to be a necessary one to formulate such reviews of various scholars' works. We can bring out a deep insight and clear perspective of the overall field in such reviews. Such collected review have been presented in a logical order, in order to the importance and a sequence of merit. This chapter is a step to get a full picture of what has been done and said about the problem under study. The review of literature is given as follows.

2.1 STUDIES ON AEROBIC

Selda (2020) changing lifestyles reduce the time spent by children on physical activity during the day. The result is an increasing frequency of childhood obesity, which has become one of the most common chronic diseases of childhood. Furthermore, the treatment of obesity in childhood is quite difficult, and the most common problem is non-compliance with obesity treatment. The path that will facilitate the adaptation to treatment comprises nutrition regulation and increased

daily physical activity and psychological support. Diet alone leads to a significant reduction in both fat and non-fat body mass. However, adding exercise to dietary therapy improves weight loss by maintaining non-fat body mass. Even though exercise alone has little effect on weight loss, it provides a significant reduction in mortality. Moreover, regular physical exercise is also an important factor in regulating body composition during growth. However, changes in the child's body during growth affect the motor power and performance, so it is necessary to plan the exercise according to the individual characteristics, age and sex of the child. Short-term frequent exercises are more entertaining and more accessible forms of exercise (dancing at home) for children, and enhance compliance with treatment. Starting treatment as soon as possible will also increase behavioral effectiveness and compliance. This paper focuses on the basics of exercise therapy, which is extremely beneficial for both healthy and obese children.

Felipe et al. (2018) examined the effect of continuous aerobic training (CAT) in hypertensive, obese people. Seven patients of average age (45.3±3.9 years), height (1.63±0.1 m), body weight (89.09±22.0 kg), and body mass index (33.44±8.6 kg/m2) were subjected to the training. CAT was performed in thrice-weekly nonconsecutive sessions (90 min per week) with intervals of 48 hr between each session. The training sessions entailed 30 min of walking at an intensity of 70%–80% of the maximum heart rate (MHR) on a treadmill over a period of eight weeks, giving a total of 24 sessions. Through correlation analyses, we found significant improvement in the systolic pressure (R=0.5675, P=0.0253) and diastolic pressure (R=0.7083, P=0.0088) when the last session was compared to the first session of training. We found no differences in the diastolic pressure and systolic

pressure before, during and after 15 min of the protocol exercise. The program showed a large effect size (ES) for systolic pressure (ES=0.85) and a small ES for diastolic pressure (ES=0.33). We found no differences in the blood pressure (BP) and heart rate (HR) during and after the training of obese hypertensive humans, but we found a positively significant correlation between HR and BP in the last session and a large ES, suggesting that this protocol exercise might have significance effect in the long term.

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Abouassi, et al., (2015) done a study (Studies Targeting Risk Reduction Interventions through Defined Exercise-Aerobic Training and/or Resistance Training) compared the effects of AT, RT, and the combination (AT/RT) on insulin action at both acute and sustained phases. Subjects (N = 196) were 18- 70 yr old (mean age = 50 yr), overweight (mean body mass index = 30 kg/m2), sedentary with moderate dyslipidemia, and were randomized into one of three 8-mo exercise groups: 1) RT: 3 days/wk, 8 exercises, 3 sets/exercise, 8-12 repetitions/set; 2) AT: equivalent to ~19.2 km/wk (12 miles/wk) at 75% peak O2 consumption; 3) AT/RT: the combination of AT and RT. One hundred forty-four subjects completed the intervention. Eighty-eight subjects completed all pre- and post-intervention testing

visits. Insulin sensitivity, glucose effectiveness, and disposition index were measured via a frequently sampled intravenous glucose tolerance test with subsequent minimal model analyses. AT/RT resulted in greater improvements in insulin sensitivity, β-cell function (disposition index), and glucose effectiveness than either AT or RT alone (all $P < 0.05$). Approximately 52% of the improvement in insulin sensitivity by AT/RT was retained 14 days after the last exercise training bout. Neither AT or RT led to acute or chronic improvement in sensitivity index. In summary, only AT/RT (which required twice as much time as either alone) led to significant acute and sustained benefits in insulin sensitivity.

Pintu (2018) studied the effectiveness of six weeks aerobic dance exercises with music on Selected Health Related Fitness Parameters among Adolescent School Girls. A total of 20 adolescent girls student were randomly chosen from the class VIII of a Govt. secondary school of Kolkata. The age of the student was in between 13 to14 years. The body fat percentage (PBF), muscular strength (MS) and muscular endurance (ME) were considered as criterion measure of this study. The instruments and tools used in this study to collect the data was AAHPERD Health Related Physical Fitness Test and skin fold calipers. Aerobic dance exercise programme was scheduled as five days per week basis for a period of six week continuously. The exercise set was repeated 4 times in each day. Duration of the exercise programme was 45 minute per day. Single experimental group design was adopted for this study. The mean and standard deviation were used as descriptive statistics. Difference between post test means and pre test mean were computed by t-test. Only 0.05 level of significance was considered in this study. All calculations were done using Excel 2007 software. Results revealed that the pre-test mean value

for PBF, MS and ME were 25.27, 22.52 Kg and 21.04 t/m respectively. The post-test mean value for PBF, MS and ME were 24.06, 27.61 Kg and 26.43 t/m respectively. The statistical calculations revealed that both the t-value for MS ($t=2.30$) and ME ($t=2.47$) for pre and post test were statistically significant ($p<0.05$). But the computed t-value for PBF ($t=0.33$) between pre and post test was found statistically insignificant ($p>0.05$). On the basis of results the study was concluded that six-week aerobics dance practice has significant effect on muscular strength and muscular endurance but has insignificant effect on body fat percentage among the adolescent school girls.

Rajkumar & Malipatil (2018) studied the effect of aerobic training on selected physical and physiological variables. For the present study 30 male students from Agriculture College, vijayapur. Were selected randomly as the subjects for the study. The age of the subjects ranged between 18 - 21 years the variables selected for the present study were aerobic training (independent variable), muscular endurance, cardio-respiratory endurance, Resting Heart Rate and Vital Capacity. For the study pre test – post test randomized group design; the subjects were further classified at random into two equal groups. Group - I underwent aerobic exercises for five days per week for eight weeks experimental group (15 students) and group - II acted as control group (15 students) was used. The data were collected through the pre test, before training and post test, after eight weeks of aerobic exercises training. For comparing pre and post test means of experimental and control groups of selected physiological variables, descriptive analysis and Analysis of Co-Variance (ANCOVA) were used, the data analyzed with the help of SPSS (16.0 version) software and the level of significance was set at 0.05 level of confidence. The result

of the study showed that there was significant difference between pre and post test (experimental group) of muscular endurance, cardio-respiratory endurance, Resting Heart Rate and Vital Capacity, Another hand there was insignificant difference between pre and post test (control group) of muscular endurance, cardio-respiratory endurance, Resting Heart Rate and Vital Capacity. On the basis of the findings it was concluded that the aerobic training might be responsible for the improvement of selected physical and physiological variables. Like muscular endurance, cardio-respiratory endurance, Resting Heart Rate, Vital Capacity (VC).

Sonia et al. (2018) conducted a study with the objective to test the effect of step aerobics training for six weeks with 6 inches step platform at 118 and 126 beats per minute (BPM) on selected kinematic (Partial Temporal) variables. The study was delimited to female subjects only (N=30), age ranging from 18 to 22 years and the intensity of training set to 118 and 126 beats per minute as protocol 1 and protocol 2 respectively. The study delimited to selected kinematic (Partial Temporal) variables namely as Leg Step up, Leg Step down, Upward Arm Swing, Downward Arm Swing and Ratio Variables. The Data Recording and quantification for pre test and post test were administered by Video Analysis (analysis for partial temporal variables) post test was conducted immediately after step aerobic training for 6 weeks with six inches step platform at 118 BMP as well as 126 BMP independently. Collected data was computed with mean, standard deviation and t-test. The selected variables for the study were Leg Step Up Variable-Right (T1), Leg Step Up Variable-Left (T2), Leg Step Down Variable-Right (T3), Leg Step Down Variable-Left (T4), Upward Arm Swing Variable (T9), Downward Arm Swing Variable (T10), Ratio Variables (T17-T32). It was concluded that there was significant effect

of step aerobics training on the selected kinematic (Partial Temporal) variables in both of the protocols. Effect of step aerobics training for six weeks in different protocol were found to be significant for biomechanical adaptation. All the selected kinematic (temporal) variables supported each other as per the existing literature or research and were found suitable for step aerobic training evaluation.

Sunanth & Sudheer (2018) assessed the effect of Yoga and Aerobic exercises among the cricket players. The subjects for the study were 30 cricket players who had participated in intercollegiate competitions. Three groups were formed, each with 10 players. Group A and Group B was experimental group whereas Group C was control group. The variables selected for the study was Speed, Agility and Leg strength. For the study the Group A and B had to undergo a training of Yoga and Aerobic exercise for a stipulated period respectively. The statistical procedure used for the study was analysis of co-variance and find out the paired mean significant different Scheffe's Post-Hoc Test was used. The test followed by a training showed significant improvement in the selected variables- speed, agility and leg strength for cricket players to come out with flying colours.

Tangarani & Gajanana (2018) lack of physical activity and an uncontrolled diet cause excessive weight gain, which leads to obesity and other metabolic disorders. A sedentary lifestyle poses a threat to individuals' health because it can lead to an increase or progression in the risk of hypertension, obesity, muscle weakness, postural defects, and lean body mass. Measurement, assessment and monitoring of BC in humans have been three of the main challenges for health sciences professionals. Effective weight management strategies consider not only

weight loss toward but also the maintenance of a healthy body weight over time. The researcher was interested in assessing the effects of twelve weeks' aerobic dance training program on body composition of young women. The body composition was assessed using waist to hip ratio and skinfold. The study was a one group pre-test post-test design with thirty subjects. The subjects selected for the study were post-graduate female students studying during 2017-18 at Kuvempu University, Shankaraghatta. Their age ranged between 20 to 25 years. All the subjects were residents of women's hostel within the main campus. The criterion measures of body composition were waist to hip ratio and skinfold measurements at four sites. Descriptive statistics like mean and standard deviation were employed on the raw scores during pre and post-test situations. The differences between mean scores were calculated using 't' test for paired samples. Findings of the study are discussed in detail. Within the limitations of the present study, it is concluded that the exercise intervention in the form of aerobic dance performed for twelve weeks is effective in reducing body fat in young women.

Zaffer et al. (2018) examined the effect of aerobic training on flexibility among endomorph students of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. Data was collected on individually through 30 Control and 30 Experimental group of subjects. The age range between 18±28 years was selected as the subject for the study. The instruction of training was given by researcher every day before starting the training in Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. purposive sampling was used for collection of data. The data were analyzed using descriptive and t test. Only one variable of Physical fitness component was selected as the independent variable i.e. flexibility and sit and reach

test was used for this study. The mean value and standard deviation of control group and experimental group in relation to flexibility of endomorph students was (1.75#4.03pre), (2.01#3.82post) and (2.21#3.53pre), (4.11#3.82post) respectively. Calculated t–ratio of control and experimental group was found 0.257 and 2.054 in relation to flexibility. The results of this study on the basis of statistical analysis states that the significant results were drawn. The experimental group have more efficient flexibility level than of the control group. Further the study reveals that aerobic training has all the essentials to improve flexibility level.

Gary et al. (2017) examined the effects of aerobic and resistance training, and their combination on health-related quality of life (HRQoL) in adolescents with overweight or obesity. After a 4-week run-in period, 304 (91 males, 213 females) post-pubertal adolescents aged 14–18 years, were randomized to 4 groups for 22 weeks of: aerobic training (n = 75), resistance training (n = 78), combined aerobic and resistance training (n = 75), or nonexercising control (n = 76). All participants received dietary counseling with a daily energy deficit of 250 kcal. Indicators of HRQoL such as overall HRQoL, and physical and psychosocial (an aggregate of emotional, social, and school functioning) HRQoL at baseline and 6 months postintervention were measured by the Pediatric Quality of Life questionnaire. The trial began in March 2005 and was completed in June 2011. In the intention-to-treat analyses, all groups showed significant improvements at 6 months on all HRQoL indicators. The aerobic group showed greater improvements than controls on physical HRQoL (mean differences of 5.5; 95% CI; 1.4–9.6, p = 0.009). In participants with ≥70% adherence, combined training produced greater improvements than control on overall HRQoL (mean differences of 4.8, 95% CI;

0.7–9.0, $p = 0.02$), physical HRQoL (mean differences of 5.8; 95% CI: 0.6–10.7; $p = 0.03$), social HRQoL (mean differences of 7.6; 95% CI: 1.0–14.2; $p = 0.02$), and school-based HRQoL (mean differences of 7.6; 95% CI: 1.0–14.2; $p = 0.02$). These findings highlight the potential importance of including resistance exercise into traditional aerobic exercise programs to maximize HRQoL in adolescents with obesity.

Harsh et al. (2017) physical exercise is one of the most effective methods to help prevent cardiovascular (CV) disease and to promote CV health. Aerobic and anaerobic exercises are two types of exercise that differ based on the intensity, interval and types of muscle fibers incorporated. In this article, we aim to further elaborate on these two categories of physical exercise and to help decipher which provides the most effective means of promoting CV health.

Jyoti & Rajkumar (2017) studied the effect of aerobic training on Physical Fitness components of hockey Players. For the purpose of study, 40 subjects were selected from Karnataka. Cardiovascular efficiency was calculated by applying Harvard Step Test. The test was conducted by girl's high school. Recorded for each and every subject. Cardiovascular efficiency was calculated to measure Physical Fitness of subjects. The descriptive Statistical mean was calculated to measure the cardiovascular efficiency of hockey Players. The result of the study revealed that there was a significant change in the Cardio-Vascular efficiency of cricket players.

Osman et al. (2017) determined the effects of 12 weeks aerobic exercise and weight-lifting plus aerobic exercise on blood pressure, blood serum lipids and lipoproteins of sedentary females. Thirty seven sedentary females (Aerobic group

mean age: 44.66 years, Weight-Lifting + Aerobic group mean age: 40.80 years) participated in this study. Before initiate the exercise their blood samples, peripheral measurements and thickness of skinfolds were taken. The subjects participated in aerobics group (n = 21) and weight-lifting plus aerobics group (n = 16) 3 times in a week through one hour. The intensity of exercise was increased gradually and their heart rates were raised up to 130-140 rates per-minute and of the tension. Two way ANOVA was used in this study. There were no significant difference between two different type of exercise groups ($p>0.05$) first group (aerobic); HDL-C (High Density Lipoprotein-Cholesterol) 18.12%, second group (weight-lifting plus aerobic) %28.23, there were a significant increase among them ($p<0.01$). Total cholesterol decrease 13.97% in group of aerobic exercise and it decreases 7.13% in group of weight-lifting plus aerobic. Triglyceride decreases 31.74% in group of aerobic exercise; it decreases 19.53% in group of weight-lifting plus aerobic exercise. Level of LDL-C was decreased 28.11% in group of aerobic exercise, 21.46% in group of weight-lifting plus aerobic. When we consider exercise types, the only flats of type is on triglyceride and APO B, ($p<0.05$), there were effects of exercise duration is on HDL-C, LDL-C AND Total cholesterol ($p<0.01$). There were effects of type and duration of exercise on TC, TG, HDL-C, LDL-C, APO A1, and APO B ($P<0.01$). In this study, regular aerobic and weight-lifting plus aerobic exercises have been shown to reduce the risk of cardiovascular disease in sedentary women and a significant improvement in systolic and diastolic blood pressures as well as reduction of cholesterol, triglyceride, and of LDL-C. Level of HDL-C was increased in both of exercise groups.

Rajkumar & Savitri (2017) examined the effect of aerobic exercise training on haematological variables among college women's. For the present study 30 college women's from Sri B.M. Patil PU College Bijapur. were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of fifteen each and named as Group 'A' and Group 'B'. Group 'A' underwent aerobic exercise training and Group 'B' underwent no training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of aerobic exercise training programme. The level of significance was set at 0.05. The findings of the present study have strongly indicates that aerobic exercise training of eight weeks has significant effect on selected haematological variables i.e., RBC and WBC of college women's. Hence the hypothesis earlier set that aerobic exercise training programme would have been significant effect on selected aerobic exercise training variables in light of the same the hypothesis is accepted. Significant effect of aerobic exercise training was found on RBC and WBC.

Siva Sangari (2017) the aerobic and zumba training is a dance fitness training that incorporates some of the basic principles of interval, resistances, plyometric training to maximize caloric output and improve cardiovascular endurance. Now a days aerobic and zumba becoming a popular mode of exercise especially among women due to its dance steps and mind relaxing catchy music background. This study intend to prove twelve weeks of aerobic and zumba training will shows impact on cardiovascular endurance among middle aged women which

was held in step up fitness center. To achieve the purpose of the study thirty subjects were selected and divided into two equal group namely zumba training (ZT) and aerobic training (AT). Their age ranged between (30-40) and subjects were asked to do training for one hour for five days in a row as for the outcome 12-minutes cooper run and walk test was used to measure cardiovascular endurance. ANCOVA was used to find out the significant differences between the groups. The 0.05 level of confidence was fixed as the level of significance, which was considered as an appropriate. The result of the study revealed that there was a significant difference in cardiorespiratory endurance in zumba and aerobic training group.

Subradeepan (2017) investigated the effect of continuous running on endurance of men kabaddi players. To achieve the purpose of this study, thirty men kabaddi players selected from the Department of Physical Education and Sports Sciences, Annamalai University, Tamilnadu, India. The age, height and weight of the subjects ranged from 19 to 21 years, 155 to 169 centimetres and 58 to 68 kilograms respectively. They were divided into two groups; each group consisted of fifteen subjects. Group-I underwent continuous running and group-II acted as control who does not participate in any training programme. The data collected from the two groups prior to and post experimentation were statistically analyzed by analysis of covariance (ANCOVA). The experimental group had significant improvement on endurance when comparing to the control group.

Yating & Danyan (2017) dyslipidemia is the risk of cardiovascular disease, and their relationship is clear. Lowering serum cholesterol can reduce the risk of coronary heart disease. At present, the main treatment is taking medicine, however,

drug treatment has its limitations. Exercise not only has a positive effect on individuals with dyslipidemia, but can also help improve lipids profile. This review is intending to provide information on the effects of exercise training on both tranditional lipids, for example, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, triglycerides and new lipids and lipoproteins such as non-high-density lipoprotein cholesterol, and postprandial lipoprotein. The mechanisms of aerobic exercise on lipids and lipoproteins are also briefly described.

Zahoor & Karthikeyan (2017) found out the impact of moderate and high intensity aerobic exercise on selected biomotor performance of college men football players. To achieve purpose of this study, 45 football players were selected from Government Boys Degree College Baramulla, State Jammu and Kashmir, India were selected as subjects at random, the age group of the subjects ranged between 17 to 22 years. The subjects were divided into three equal groups of 15 each. Group-I underwent moderate aerobic intensity training, group-II underwent high aerobic intensity training and group-III acted as control subjects, which didn't participate in any special training apart from their regular activities. The following bio motor variables namely balance and coordination performance was selected as criterion variables. All the subjects of three groups were tested on selected dependent variables at prior to and immediately after the training programme. The ANCOVA (analysis of co variance) was used to analyze the significant difference, if any among the groups. The .05 level of confidence was fixed as the level of significance which was considered as an appropriate. The results of the study revealed that there was a significant improvement on selected biomotor variables such as balance and

coordination for moderate aerobic intensity training group and high aerobic intensity training group as compared to control group among college men football players.

Ozhan Bavl (2016) investigated the effects of eight weeks of step aerobic exercises on static balance, flexibility and selected basketball skills in young basketball players. A total of 20 basketball players (average age 16.1±0.7 years and average sporting age 4.1±0.7 years) voluntarily joined the study. Participants were randomly divided into two groups (experiment n:10 and control n:10). All participants attended basketball training 3 days per week but the experiment group also had step aerobic dance practice 2 days per week. Before and after the study static balance, flexibility and selected basketball techniques were evaluated. SPSS statistical program used for analysis. Repeated measures Anova was used to compare the pre-test and post-test measurements of the groups. The differences between pre-test and post-test measurements in the two groups were examined with the independent t-test. $P< 0.05$ is considered statistically significant in the interpretation of our results. After eight weeks of training, both two groups' static balance and flexibility performances were significantly changed. But only the experiment group had significant improvement in the basketball skill test. The experiment group was also statistically changed in terms of all parameters compared to the control group. According to the results of this study it is possible to say that to improve basketball skills by improving balance and flexibility performance, eight weeks of step aerobic exercise is a useful training model for young basketball players.

Vivek et al. (2016) myocardial Infarction is the leading cause of global mortality. The prevalence rate is 30 million in India. Researchers have found that step aerobic exercise is more effective than other exercises in reducing body fat & blood pressure. This study was designed to examine the effects of moderate intensity step aerobics on heart rate, blood pressure, triglycerides, High density lipoprotein & Low density lipoprotein on a patient with acute Myocardial Infarction. A 55 years old male diagnosed with acute anterior wall Myocardial Infarction was selected for the study based on risk stratification schema two months post discharge from hospital. The exercise session consisted of a 3 phase exercise program 1) a warm-up (10 min of dance aerobics); 2) aerobic exercise training (20 min of step aerobics); 3) a cool-down (10 min of breathing and flexibility exercises) total 40 minutes duration and included three sessions per week. Exercise intensity was controlled by monitoring targeted heart rate. Measurements of Heart rate, Blood pressure were recorded before, at 5 min & 40 min post intervention. Triglycerides, HDL & LDL levels were measured at baseline and at 8th week post intervention. It shows variations in systolic blood pressure and heart rate at baseline and after 8 weeks. No difference in diastolic blood pressure. Significant difference between high density lipoprotein, low density lipoprotein and triglycerides level was observed at the end of 8 weeks. Our findings showed that step aerobics significantly improved heart rate, systolic Blood Pressure and experienced an increase in HDL. This type of currently 'popularised' low-cost step aerobic exercise has an important role in the prevention and reducing the morbidity of cardiovascular diseases.

Anek et al. (2015) developed an aerobic step combined with resistance training exercise program, and to compare the effects of A) aerobic step exercise

training (STE), B) resistance aerobic exercise training (RES), C) a combined aerobic step with resistance exercise training (COM) on the health-related fitness, balance, and biochemical bone markers. Sixty participants were working female volunteers at the age of 35-45. They were divided into 4 groups by simple random sampling method. Fifteen of the participants were in the STE group, 14 in the RES group, 15 in the COM group, and 16 in the control group (CON). The STE, RES and COM exercise training programs were designed to yield the same intensity and achieve the same range of heart rate during each stage of the program. During the training, music was used to set the tempo of the workouts. At the 8th week, it was found that resting heart rate and systolic blood pressure significantly-increased only in the STE and COM groups. After 16 weeks, the experiment results showed the significant improvement in the COM and STE groups of exercise training for β-CrossLaps, P1NP NMID Osteocalcin and bone formation (PINP/β-CrossLaps x0.31) but not in the RES group. For balance ability, the COM group showed significantly greater change than the RES group after the training intervention ($p < 0.05$). It can thus be concluded that the STE and COM training were effective in improving bone formation (PINP/β-CrossLaps x 0.31) but not in the RES group. For balance ability, the COM group showed more significant change than the RES group. Therefore, this is not only a good exercise choice for the working-age people but also it can help reduce the risks of osteoporosis and falling in women in particular.

Goldfield et al. (2015) determined the effects of aerobic training, resistance training, and combined training on mood, body image, and self-esteem in adolescents with obesity. Method: After a 4-week prerandomization treatment, 304 post pubertal adolescents (91 males, 213 females) with obesity ages 14–18 years

were randomized to 1 of 4 groups for 22 weeks: aerobic training (n = 75), resistance training (n = 78), combined aerobic and resistance training (n = 75), or non-exercising control (n = 76). All participants received dietary counseling, with a daily energy deficit of 250 kcal. Mood was measured using the Brunel Mood Scale. Body image was assessed using the Multiple Body Self-Relations Questionnaire, and physical self-perceptions and global self-esteem were measured using the Harter Physical Self-Perceptions Questionnaire. Results: Median adherence was 62%, 56%, and 64% in aerobic, resistance, and combined training, respectively. Resistance and combined training produced greater improvements than control on vigor, and resistance training reduced depressive symptoms. All groups improved on body image and physical self-perceptions, but combined showed greater increases than control on perceived physical conditioning, while only resistance training showed greater increases than controls on global self-esteem. Both combined and resistance training demonstrated greater increases in perceived strength than control. Psychological benefits were more related to better adherence and reductions in body fat than changes in strength or fitness. Conclusion: Resistance training, alone or in combination with aerobic training, may provide psychological benefits in adolescents with overweight or obesity, and therefore could be an alternative to aerobic training for some individuals in the biological and psychological management of adolescent obesity.

Jayachandran (2015) examined the effect of yogasana and step aerobic exercises on selected physiological parameters. To achieve these purpose 45 school boys' students were selected from Chidambaram region selected as subjects. Their age group ranged from 14 to16 years. They were divided in to three equal groups of

15 subjects each and assigned to Experimental group-1, Experimental group-2 and control group. The group-1 underwent yogasana+ pranayama exercises and the group-2 utilized step aerobic training. The experimental groups underwent their respective training programme three days per week (alternate days) for twelve weeks. The criterion variables selected are resting pulse rate, vital capacity and breath holding time. ANCOVA was used to find out the significant differences. Statistical analysis found significant differences between yogasana exercises and step aerobics training in improving the physiological parameters. Step aerobics training differed significantly ($p<0.05$) from both yogasana exercises and control groups for resting pulse rate. Both experimental groups improves breath holding time when compare to control group.

Izabela et al. (2013) evaluated the influence of step aerobics training on VOmax, isometric strength and body composition of young female students. Female students aged 19–21 of University of Physical Education and Sport in Gda□sk were subjects in this study. VO2max, isometric strength of elbow flexors and knee extensors, as well as body composition, were measured week before and week after a ten-week step aerobics training. For statistical analysis, basic descriptive statistics and student's t-test were applied for dependent variables. After ten weeks of training there were no statistically significant changes in body composition, probably due to lack of calorie intake control. Significant changes were observed in isometric strength of elbow flexors but no changes in isometric strength of knee extensors. There was a compensation in isometric strength noted between left and right leg after ten weeks of training, where left leg was weaker than the right leg before training. Significant changes were noted in VO2max values, which increased from

42.04 ml/kg/min–1 to 45.71 ml/kg/min–1. Step aerobics training can sufficiently increase VO2max in young females and has a potential in developing strength of upper extremities. When body composition is the main purpose, diet should be taken under consideration.

Joanna et al. (2013) investigation was to look for relationships between the repeatability of forces generated during the movement rhythm present in step aerobics and the movement to a rhythm by the upper and lower limbs alone. As step aerobics requires the symmetric involvement of both the upper and lower limbs, it appears to be important to examine whether a relationship exists between repeatability of a rhythm and a repeatability of forces generated when moving to a rhythm. As step aerobics is considered an endurance activity, the repeatability of the force reproduced by the lower limb muscles may be important in the prevention of injury. The study involved using a mock step bench which consisted of two Kistler force plates. The 29 female subjects of the study executed two motor tasks. The first task was hitting the plate with the dominant and the non-dominant upper and lower limb to a musical rhythm. The second task consisted in performing the basic step of step aerobics on the bench. The rhythm in both tasks was dictated by the beat of a metronome. No statistically significant differences were found between respectability of producing a rhythm by the dominant and non-dominant upper and lower limbs. No correlation was found between the rhythm reproduction error of the limbs and the accuracy of moving to a rhythm during the step aerobics task. This second task was characterized by a high repeatability of the generated forces and a high variability in following a musical rhythm. Body mass does not influence the force generated during rhythm reproduction with the upper and lower limbs. During

step walking, the study participants were characterized with a high repeatability of generated force and also by a high variability in following a musical rhythm.

Pereira et al. (2013) examined the effects of 8 weeks of strength training program alone or combined exercise (step aerobics exercise and strength training) on Body Mass Index (BMI), waist circumference (WC), and maximal strength (1RM) in lower- and upper-body extremities. Thirty-six women were randomized into three groups: strength training (S, N.=13; age: 61.0±9.3 years, BMI: 27.3±4.7 kg/m2), combined step aerobics training and strength training (SE, N.=11; age: 58.3±8.1 years, BMI: 27.8±3.7 kg/m2), or control (C, N.=12; age: 59.0±7.2 years, BMI: 29.5±4.8 kg/m2) groups. Subjects from both experimental groups performed 3 training sessions per week for 45-60 minutes per session. The S was submitted to a high-speed training that consisted of 40% to 75% of 1RM (3 sets 4–12 reps). The SE group combined aerobic exercise using step platform plus strength training. Both training groups significantly improved leg press (S, 80.7% and SE, 42.4%, P<0.001 respectively) and leg extension strength (S, 71% and SE, 35.7%, P=0.000 respectively). However, only the S group showed a significant increase in seated bench press maximal strength (S, +116.7%, SE, +13.6%, P=0.266 and P=0.000 respectively). Over the 8-week training period, the SE group showed significant changes in BMI and in waist circumference (-5.3%, P=0.016 and -3.0%, -2.5 cm, P=0.005, respectively). No significant differences were found in the S or C groups. Decreases in body fat and waist circumference were more evident following combined training. In contrast, higher strength gains particularly for the upper body occurred following 8 weeks of strength training alone compared to combined training.

Rifat et al. (2013) investigated the effects of eight-week step-aerobic exercise programs on flexibility, body weight, body fat percentage and body circumference measurements of sedentary women. 20 sedentary female volunteers participated in the study. Step-aerobic exercises were applied to for every participant for 8 weeks, three days a week and 45 minutes per day. Data were analyzed by using SPSS 17.0 software. For statistical analysis, Paired-t test was used. Significance level was determined to be 0.05. Significant differences were found between mean values of pre-and post-tests (flexibility = 3.35cm; body weight = 4.48 kg; body fat percentage = 3.39%, and the number of heart beats = 4 beats/min) ($p<0.05$). As a result of the step-aerobic exercises, flexibility and all parameters related with the body composition of the individuals were changed positively. The study showed similarity with the results of other studies.

Vallimurugan (2013) examined the effect of aerobic dance training on haematological variables among Ball Badminton players. For the present study 30 female ball badminton players from Selvam Group of Institutions, Namakkal, Tamilnadu were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of fifteen each and named as Group 'A' and Group 'B'. Group 'A' underwent aerobic dance training and Group 'B' underwent no training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of aerobic dance training programme. The level of significance was set at 0.05. The findings of the present study have strongly indicates that aerobic dance

training of twelve weeks has significant effect on selected haematological variables i.e., RBC and WBC of ball badminton players. Hence the hypothesis earlier set that aerobic dance training programme would have been significant effect on selected aerobic dance training variables in light of the same the hypothesis is accepted. Significant effect of aerobic dance training was found on RBC and WBC.

Yasmina et al. (2013) investigated the effects of 8-week step aerobic exercises on young women's physiological characteristics, body fat percentage, and quality of life. In so doing, 15 active women with the mean age 26/24 ± 5/86 years, mean weight 61/26 ± 10/85kg, and mean height 160/70 ± 6/25 cm as well as 15 employed women with the mean age 25/94 ± 5/88 years, mean weight 61/60 ± 10/95 kg, and mean height 162/33 ± 6/07 cm voluntarily participated in the study. First, the participants filled out a personal information questionnaire; then, a pretest was conducted, which incorporated tests of Profile Of Mood States (POMS) questionnaire, and tests of height, weight, subcutaneous fat, sit and reach, dyno drag, and strand to measure variables of bewilderment, vitality, fatigue, height, weight, fat percentage, flexibility of back, the strength of back muscles, and maximum oxygen uptake, respectively. Then, the participants of both groups did step aerobic exercise for 8 weeks – 3 sessions of 50 to 60 minutes per week. The same tests were embedded in the post-test. For statistical analysis, descriptive statistics and as for the comparison of the two groups, SPSS was used to perform Mann–Whitney test ($p<0/05$). The results confirmed that step aerobic exercises lead to a significant decrease in fat percentage ($p=0/02$); however, they increase flexibility ($p=0/003$), back muscle strength ($p=0/003$), and maximum oxygen uptake ($p=0/000$), relieve fatigue ($p=0/02$) and bewilderment ($p=0/01$), and finally boost vitality ($p=0/02$) as

well. Generally, doing step aerobic exercises has a dramatic and positive effect on women's physiological characteristics and the quality of their lives. Therefore, it seems necessary to repeat the exercises more and concentrate on the strength of upper body muscles.

Zaletel, et al. (2013) the training effects of contemporary aerobics programmes (hi lo, dance aerobics, step aerobics, aqua aerobics etc.) have been frequently investigated. However, we found no recent paper which reviewed aerobic programmes with regard to their training effectiveness, characteristics of the subjects involved, variables of interest and experimental design. In this paper we summarise the findings of more than 40 studies published in the 2000-2011 period that investigated the training effects of different forms of contemporary aerobics. In this review, the studies are grouped according to their characteristics (sample of subjects, variables of interest, study design, effects, etc.). Around 80% of the investigations dealt with females, with adults being most commonly observed. In the majority of investigations, the authors studied different variables at the same time (morphological anthropometric, motor, cardiovascular, biochemical indices, etc.). In recent studies a trend toward a psychological status examination is evident. In most instances positive training effects on motor-endurance and varsity of physiological variables are declared throughout a training period of 8 to 12 weeks. However, the positive changes in anaerobic endurance are not evidenced. Knowing the tendency of the overall increase of certain psychological disorders in population (including depression) there are indications that future, potentially highly interesting studies will deal with the psychological status of adults and older subjects.

Lundberg, et al. (2012) assessed the influence of an acute aerobic exercise bout on molecular responses to subsequent resistance exercise. Nine physically active men performed 45 min one-legged cycle ergometry exercise, and 4 × 7 maximal concentric-eccentric knee extensions for each leg 6 hrs later. Thus, one limb was subjected to aerobic and resistance exercise (AE+RE), and the contralateral limb to resistance exercise (RE) only. Knee extensor peak power was determined. Biopsies were obtained from m.vastus lateralis before, 15 min and 3 hrs after resistance exercise. Analysis determined glycogen content, mRNA-levels (vascular endothelial growth factor; VEGF, peroxisome proliferator-activated receptor-γ coactivator-1; PGC-1α, muscle RING-finger protein-1; MuRF-1, atrogin-1, myostatin) and phosphorylated proteins (mammalian target of rapamyacin; mTOR, p70S6 kinase; p70S6K, ribosomal protein S6; rpS6, eukaryotic elongation factor 2; eEF2). Peak power was similar in AE+RE and RE. After resistance exercise, the time-course of glycogen utilization and protein signaling was similar across legs. However, phosphorylation of mTOR and p70S6K was elevated in AE+RE vs. RE (main effect $P < 0.05$). VEGF and PGC-1α was higher in AE+RE than RE at PRE and POST1 ($P < 0.05$). Myostatin was lower in AE+RE vs. RE at PRE and POST1 ($P < 0.05$), and downregulated in RE after resistance exercise. Atrogin-1 was higher in AE+RE than RE at PRE and POST1 ($P < 0.05$), and decreased following resistance exercise in AE+RE. MuRF-1 was similar across legs. No difference for any marker was evident at POST2. These results suggest that acute aerobic exercise alters molecular events regulating muscle protein turnover during the early recovery period from subsequent resistance exercise.

Ravinder, et al. (2012) concluded the aerobic training reduce the Total Cholesterol, Triglycerides and LDL cholesterol levels. Different types of exercise programms on the lipid profiles of the individuals might contribute for the enhancement of knowledge in this area, and will be certainly useful to create different protocols of exercise to different individuals basing on the requirements of the individuals. Awareness of Anaerobic training and Aerobic training will help in creating new ideas, and may lead to considerate the knowledge on the effects of exercise on the individuals health related physical fitness. Lack of exercise (Detraining) for one month may increase the Total Cholesterol, Triglycerides and LDL cholesterol levels.

Smol & Fredyk (2012) investigated whether 6-week low-intensity aerobic training program used as a supplement to regular dance practice might improve both the aerobic capacity and psychomotor performance in female ballet dancers. To assess their maximal oxygen uptake (VO2max) and anaerobic threshold (AT), the dancers performed a standard graded bicycle ergometer exercise test until volitional exhaustion prior to and after the supplementary training. At both these occasions, the psychomotor performance (assessed as multiple choice reaction time) and number of correct responses to audio-visual stimuli was assessed at rest and immediately after cessation of maximal intensity exercise. The supplementary low-intensity exercise training increased VO2max and markedly shifted AT toward higher absolute workload. Immediately after completion of the graded exercise to volitional exhaustion, the ballerinas' psychomotor performance remained at the pre-exercise (resting) level. Neither the resting nor the maximal multiple choice reaction time and accuracy of responses were affected by the supplementary aerobic training. The

results of this study indicate that addition of low-intensity aerobic training to regular dance practice increases aerobic capacity of ballerinas with no loss of speed and accuracy of their psychomotor reaction.

Aranga & Kulothungan (2011) studied effect of different intensity aerobic exercise on body composition variables among middle aged men. Sixty male subjects were selected randomly divided four groups and each group consists of fifteen subjects each. The age ranged from 35 to 45. Group 1 underwent as low intensity aerobic exercise, group II underwent moderate intensity aerobic exercise, group III underwent high intensity aerobic exercise and group IV acted as control group. The experimental groups underwent their intensity aerobic exercise programme three days per week for twelve weeks. Control group did not undergo any training programme rather than their routine work. The body composition are percentage body fat and lean body mass were measured by using skin fold caliper. Prior to and after end of practice period all subjects were tested. The results of pre-test and post-test were compared with using Analysis of Co-variance. The results showed that high intensity aerobic exercises were significantly better than low and moderate aerobic exercises in percentage body fat. The moderate and high intensity aerobic exercises significantly influenced lean body mass of middle age men.

Edvardsen, et al. (2011) compared the aerobic capacity during maximal aerobic dance and treadmill running in fit women. Thirteen well-trained female aerobic dance instructors aged 30 ± 8.17 years (mean ± SD) exercised to exhaustion by running on a treadmill for measurement of maximal oxygen uptake ($\dot{V}O_2max$) and peak heart rate (HRpeak). Additionally, all subjects performed aerobic dancing

until exhaustion after a choreographed videotaped routine trying to reach the same HRpeak as during maximal running. The p value for statistical significance between running and aerobic dance was set to ≤0.05. The results (mean ± SD) showed a lower V̇O2max in aerobic dance (52.2 ± 4.02 ml·kg−1·min−1) compared with treadmill running (55.9 ± 5.03 ml·kg−1·min−1) (p = 0.0003). Further, the mean ± SD HRpeak was 182 ± 9.15b·min−1 in aerobic dance and 192 ± 9.62 b·min−1 in treadmill running, giving no difference in oxygen pulse between the 2 exercise forms (p = 0.32). There was no difference in peak ventilation (aerobic dance: 108 ± 10.81 L·min−1 vs. running: 113 ± 11.49 L·min−1). In conclusion, aerobic dance does not seem to be able to use the whole aerobic capacity as in running. For well endurance-trained women, this may result in a lower total workload at maximal intensities. Aerobic dance may therefore not be as suitable as running during maximal intensities in well-trained females.

Nagaraj, et al. (2011) studied effect of stretching exercises and aerobic exercises on flexibility of school boys. For this study sixty school boys were selected at random from Velankanni Matriculation Higher secondary school, Puducherry and their age ranged from 14 -17years. The selected subjects divided in to four groups each group consist of fifteen subjects. Group I underwent stretching exercises, group II underwent aerobics exercises, group III underwent combined exercises (stretching and aerobics exercises) and group IV is control group. The three experimental groups were subjected to the training programme for 10 weeks for three days per week. Control group did not undergo any training programme rather than their routine work. Flexibility was measured by using sit and reach box. Prior to and after end of practice period all subjects were tested. The results of pre-

test and post-test were compared with using Analysis of Covariance. The result shows that combined exercises (stretching and aerobics exercises) were significantly better than stretching exercises, aerobics exercises in flexibility.

Goulopoulou, et al. (2010) 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.

2.2 STUDIES ON WEIGHT TRAINING

Eliane A. Castro., Eliana V. Carraca., Rocio Cupeiro, Bricia Lopez-Plaza (2020). The Effects of the Type of Exercise and Physical Activity on Eating Behavior and Body Composition in Overweight and Obese Subjects. *Nutrients* 2020, 12, 557.

Eliane et al. (2020) examined whether a type of exercise favors better compliance with a prescribed diet, higher eating-related motivation, healthier diet composition or greater changes in body composition in overweight and obese subjects. One hundred and sixty-two (males n = 79), aged 18–50 years, were randomized into four intervention groups during 24 weeks: strength, endurance, combined strength + endurance and guideline-based physical activity; all in combination with a 25–30% caloric restriction diet. A food frequency questionnaire and a "3-day food and drink record" were applied pre- and post-intervention. Diet and exercise-related motivation levels were evaluated with a questionnaire developed for this study. Body composition was assessed by DXA and habitual physical activity was measured by accelerometry. Body weight, body mass index (BMI) and body fat percentage decreased and lean body mass increased after the intervention, without differences by groups. No interactions were observed between intervention groups and time; all showing a decreased in energy intake ($p < 0.001$). Carbohydrate and protein intakes increased, and fat intake decreased from pre- to post-intervention without significant interactions with intervention groups, BMI category or gender ($p < 0.001$). Diet-related motivation showed a tendency to increase from pre- to post-intervention (70.0 ± 0.5 vs 71.0 ± 0.6, $p = 0.053$), without

significant interactions with intervention groups, BMI or gender. Regarding motivation for exercise, gender x time interactions were observed ($F(1,146) = 7.452$, $p = 0.007$): Women increased their motivation after the intervention (pre: 17.6 ± 0.3, post: 18.2 ± 0.3), while men maintained it. These findings suggest that there are no substantial effects of exercise type on energy intake, macronutrient selection or body composition changes. After a six-month weight loss program, individuals did not reduce their motivation related to diet or exercise, especially women. Individuals who initiate a long-term exercise program do not increase their energy intake in a compensatory fashion, if diet advices are included.

Muhammad Nor Faiz Abd Aziz, Norhazira Abd Rahim, Nor Aijratul Mohammad Shalan, Nor Fazila Abd Malek & Ali Md Nadzalan (2020). The Effect Of Weight Training On Muscle Strength, Muscle Endurance And Body Composition Among Overweight Individuals. *International journal of scientific & technology research.* 9, 04.

Muhammad et al. (2020) weight training is one of the training method that often been used to gain muscle strength and size. The aim of this study was to identify the effects of weight training on body mass index (BMI), muscle mass, body fat percentage, hand grip strength and maximal repetition of weight gain in overweight men. This study was conducted using experimental method through pre- and post-test. Body composition analyzer was used to measure BMI, fat percentage and muscle mass. Muscle strength was measured by using the maximum hand grip test while muscle endurance by using the maximum push-up test. The subjects of this study were consisted of 20 individuals (male, BMI 25.76 ± 1.35, age $23.05 \pm$

2.14 years old). Weight training intervention was conducted 3 times per week for 4 weeks. The result shows there was a significant effect of weight training on maximum push-up repetition (p = .000, p<.005). However there were no significant effect of weight training on BMI (p = .586), mass muscle (p = .163), body fat percentage (p = .659) and maximum hand grip (p = .179). In conclusion, the 4-weeks weight training is able to increase the muscle endurance among overweight males. Therefore, it can be suggested that weight training as one of the strategy to improve muscle endurance among overweight males. For future study, it is suggested that the duration of the weight training intervention to be extended to obtain a significant effect.

Helen Collins, Samantha Fawkner, Josephine N. Booth & Audrey Duncan (2018). The effect of resistance training interventions on weight status in youth: a meta-analysis. *Sports Med Open.* 4: 41.

Helen et al. (2018) examined the effect of resistance training on weight status in youth, with participants of school age (5–18 years). There were 24 complete sets of data from 18 controlled trials (CTs) which explored 8 outcomes related to weight status. Significant, small effect sizes were identified for body fat% (Hedges' $g = 0.215$, 95% CI 0.059 to 0.371, $P = 0.007$) and skinfolds (Hedges' $g = 0.274$, 95% CI 0.066 to 0.483, $P = 0.01$). Effect sizes were not significant for: body mass (Hedges' $g = 0.043$, 95% CI -0.103 to 0.189, $P = 0.564$), body mass index (Hedges' $g = 0.024$, 95% CI -0.205 to 0.253, $P = 0.838$), fat-free mass (Hedges' $g = 0.073$, 95% CI -0.169 to 0.316, $P = 0.554$), fat mass (Hedges' $g = 0.180$, 95% CI -0.090 to 0.451, $P = 0.192$), lean mass

(Hedges' $g = 0.089$, 95% CI -0.122 to 0.301, $P = 0.408$) or waist circumference (Hedges' $g = 0.209$, 95% CI -0.075 to 0.494, $P = 0.149$). The results of this meta-analysis suggest that an isolated resistance training intervention may have an effect on weight status in youth. Overall, more quality research should be undertaken to investigate the impact of resistance training in youth as it could have a role to play in the treatment and prevention of obesity.

Paes, Santiago Tavares, Marins, João Carlos Bouzas, & Andreazzi, Ana Eliza. (2015). Metabolic effects of exercise on childhood obesity: a current view. *Revista Paulista de Pediatria*, *33*(1), 122-129.

Paes et al. (2015) reviewed the current literature concerning the effects of physical exercise on several metabolic variables related to childhood obesity. A search was performed in Pubmed/MEDLINE and Web of Science databases. The keywords used were as follows: Obesity, Children Obesity, Childhood Obesity, Exercise and Physical Activity. The online search was based on studies published in English, from April 2010 to December 2013. Search queries returned 88,393 studies based on the aforementioned keywords; 4,561 studies were selected by crossing chosen keywords. After applying inclusion criteria, four studies were selected from 182 eligible titles. Most studies found that aerobic and resistance training improves body composition, lipid profile and metabolic and inflammatory status of obese children and adolescents; however, the magnitude of these effects is associated with the type, intensity and duration of practice. Regardless of the type, physical exercise promotes positive adaptations to childhood obesity, mainly acting to restore cellular

and cardiovascular homeostasis, to improve body composition, and to activate metabolism; therefore, physical exercise acts as a co-factor in fighting obesity.

Magnani et al. (2020) investigated the effects of 2 types of resistance training (RT) models in conjunction with interdisciplinary interventions by other health professionals to reduce the body fat and cardiometabolic risk of obese adolescents while improving their general health-related physical fitness. The 12-week analyses involved 18 male adolescents who were split into 2 groups (weight lifting: n = 9 and functional: n = 9), with equalization according to the primary muscle group (whenever possible), the effort:pause ratio, and intensity. The results showed reductions in fat mass and body fat, as well as in waist and hip circumferences ($p < 0.05$) after the intervention period. However, no significant differences were observed in terms of the body mass, body mass index, neck circumference, systolic and diastolic blood pressures, and for lean mass ($p > 0.05$) after the respective period. Maximal isometric strength, abdominal strength resistance, flexibility, and maximal oxygen consumption all produced significant increases after the interventions ($p < 0.05$). There were reductions in low-density lipoproteins and triglyceride levels after the intervention period ($p < 0.05$). For fasting glycemia, high-density lipoproteins, and alanine aminotransferase, no differences were observed ($p > 0.05$). In addition, no differences were observed in rating of perceived recovery, internal training load, or caloric intake ($p > 0.05$). With the results presented, it is concluded that both RT methods were effective at reducing both fat mass and body fat, thus improving health-related physical fitness components and decreasing cardiometabolic risk.

Ribeiro et al. (2020) phase angle (PhA) is a viable indicator of cellular health, with higher values reflecting better cellularity, cell membrane integrity, and cell function. Adaptive responses to resistance training (RT) on PhA may be important in obese older people. The main purpose of the present study was to investigate the effects of 8 weeks of RT on PhA in obese older women. Thirty-three obese older women (68.1 ± 5.7 years, 71.6 ± 10.1 kg, 154.5 ± 6.7 cm, 30.0 ± 4.1 kg•m −2 , and 45.0 ± 6.0% body fat) were randomly allocated into 1 of 2 groups: a training group that performed the RT program (TG, n = 18) or a nonexercise control group (CG, n = 15). The whole-body RT consisted of an 8-week RT program involving 8 exercises performed for 3 sets of 8–12 repetitions 3 times a week. Anthropometric, body fat and fat-free mass, PhA, total body water (TBW), intracellular water (ICW), and extracellular water compartments were performed at before and after training. After the intervention period, the TG presented greater increases ($p < 0.05$) than CG for fat-free mass (TG = +1.3% and CG = −0.3%), TBW (TG = +2.0% and CG = −1.7%), ICW (TG = +3.1% and CG = −1.9%), and PhA (TG = +3.4% and CG = −1.4%), and lower values for percentage of body fat (TG = −1.3% and CG = +0.9%) and bioimpedance resistance (TG = −4.6% and CG = +2.3%). Our results suggest that 8 weeks of RT improves PhA—a cellular health parameter—in obese older women.

Wilson et al. (2020) investigated the impact of an isocaloric and isonitrogenous ketogenic diet (KD) versus a traditional western diet (WD) on changes in body composition, performance, blood lipids, and hormonal profiles in resistance-trained athletes. Twenty-five college-aged men were divided into a KD or traditional WD from weeks 1 to 10, with a reintroduction of carbohydrates from

weeks 10 to 11, while participating in a resistance training program. Body composition, strength, power, and blood lipid profiles were determined at weeks 0, 10, and 11. A comprehensive metabolic panel and testosterone levels were also measured at weeks 0 and 11. Lean body mass (LBM) increased in both the KD and WD groups (2.4% and 4.4%, $p < 0.01$) at week 10. However, only the KD group showed an increase in LBM between weeks 10 and 11 (4.8%, $p < 0.0001$). Finally, fat mass decreased in both the KD (−2.2 ± 1.2 kg) and WD groups (−1.5 ± 1.6 kg). Strength and power increased to the same extent in the WD and KD conditions from weeks 1 to 11. No changes in any serum lipid measures occurred from weeks 1 to 10; however, a rapid reintroduction of carbohydrate from weeks 10 to 11 raised plasma triglyceride levels in the KD group. Total testosterone increased significantly from weeks 0 to 11 in the KD diet (118 ng•dl −1) as compared to the WD (−36 ng•dl −1) from pre to post while insulin did not change. The KD can be used in combination with resistance training to cause favorable changes in body composition, performance, and hormonal profiles in resistance-trained men.

Batista et al. (2020) examined the independent and combined effects of pubertal and weight status on concurrent measurements of peak oxygen ($\dot{V}O_2$ peak) in school-aged adolescent males. The final sample included 49 boys (12.3 ± 0.8 years). $\dot{V}O_2$ peak was derived from an incremental progressive maximal protocol using a motorized treadmill. In addition, maximal oxygen uptake was estimated from a 20-m shuttle run test. Static allometric models were obtained as an alternative to performance output per unit of size descriptors. Weight status had a significant effect on $\dot{V}O_2$ peak using simple ratio standards per unit of body mass (BM) with adolescents classified as overweight and obese (OWOB) attaining lower

values of V̇ O 2 peak. A similar trend was noted for the allometric models adopting body mass (ml•kg BM −0.542 •min −1), stature (L•m −2.602 •min), and fat-free mass (FFM; ml•kg FFM −0.907 •min −1). Findings also suggest the influence and interaction of pubertal and weight status on absolute values of V̇ O 2 peak. Considering the data obtained, linear equations to estimate V̇ O 2 peak from the 20-m shuttle run test should not be applied to boys who are OWOB because it will produce inaccurate assessments of cardiorespiratory fitness and penalize those who are heavier. Equations for V̇ O 2 peak prediction need to be specific for pubertal status and preferably consider FFM as a body size descriptor.

Nobre et al. (2017) analyzed the effects of a protocol of plyometric training on body composition and motor performance of boys who were overweight/obese aged 7–9 years. The sample was randomly assigned into 2 groups: plyometric training group (T, n = 40) and control group (C, n = 19). Training consisted of 20 min•d −1 (twice a week, during 12 weeks) of lower extremity plyometric exercise. Health-related physical fitness was measured by handgrip strength, standing long jump (SLJ), curl-ups, sit and reach, square test, running speed, and mile run test. Gross motor coordination was evaluated by means of the Körperkoordinations-test für Kinder (KTK) tests. Baseline and postintervention differences were investigated, and effect size was estimated through Cohen's d coefficient. Both groups showed increased body weight, height, and sitting height after intervention with a negligible effect size. Only T group showed increased fat-free mass (p = 0.011) compared with baseline values with small effect size. Plyometric training improved handgrip strength (d = 0.23), sit and reach (d = 0.18), curl-ups (d = 0.39), SLJ (d = 0.80), agility (d = 0.48), and time in the mile run test (d = 0.38). For gross motor

coordination results, T group showed better performance in all tests after plyometric training with moderate/large effect size. Thus, 12 weeks of PT improved health-related physical fitness components and motor coordination acquisition of 7- to 9-year-old boys who were overweight/obese.

Moraes et al. (2013) compared 2 models of resistance training (RT) programs, nonperiodized (NP) training and daily nonlinear periodized (DNLP) training, on strength, power, and flexibility in untrained adolescents. Thirty-eight untrained male adolescents were randomly assigned to 1 of 3 groups: a control group, NP RT program, and DNLP program. The subjects were tested pretraining and after 4, 8, and 12 weeks for 1 repetition maximum (1RM) resistances in the bench press and 45° leg press, sit and reach test, countermovement vertical jump (CMVJ), and standing long jump (SLJ). Both training groups performed the same sequence of exercises 3 times a week for a total of 36 sessions. The NP RT consisted of 3 sets of 10–12RM throughout the training period. The DNLP training consisted of 3 sets using different training intensities for each of the 3 training sessions per week. The total volume of the training programs was not significantly different. Both the NP and DNLP groups exhibited a significant increase in the 1RM for the bench press and 45° leg press posttraining compared with that pretraining, but there were no significant differences between groups ($p \leq 0.05$). The DNLP group's 1RM changes showed greater percentage improvements and effect sizes. Training intensity for the bench press and 45° leg press did not significantly change during the training. In the CMVJ and SLJ tests, NP and DNLP training showed no significant change. The DNLP group showed a significant increase in the sit and reach test after 8 and 12 weeks of training compared with pretraining; this did not

occur with NP training. In summary, in untrained adolescents during a 12-week training period, a DNLP program can be used to elicit similar and possible superior maximal strength and flexibility gains compared with an NP multiset training model.

2.3 SUMMARY OF REVIEW OF RELATED LITERATURE

The investigator has compiled and reviewed all the literature and professional reviews related to effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students from the library of TNPESU and the material available on the internet to provide sufficient knowledge to the readers and comparative analysis of the present study.

The reviews show that there are significant positive effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students. The investigator has found very few studies made on comparative analysis with aerobic rhythmic exercise and weight training. Based on the experience gained the investigator formulated a suitable methodology to be applied in this research that is presented in chapter III.