Chapter II

REVIEW OF RELATED LITERATURE
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A literature review can be defined as the selection of available documents (both published and unpublished) on the topic, which contain information, ideas, data and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents in relation to the research being proposed (Hart, 1998). According to Bruce (1994) “Typically, the literature review forms an important chapter in the thesis, where its purpose is to provide the background to and justification for the research undertaken.” The purpose of the literature review is to locate the research project, to form its context or background, and to provide insights into previous work (Blaxter et al., 2006).

In this study, the different aspects of the overweight students such as selected components of weight and fat related variables has been studied. In order to study these aspects thoroughly the literature has been divided into four parts. In the first part studies related to aerobics related research review, in second part studies related to Swiss ball and pilates exercise related research, in third part gymnastics effect to weight and fat component and in the third four part the studies related to aquatics exercise effect to weight and fat related research have been covered.

REVIEW OF RELATED LITERATURE OF AEROBICS EXERCISE REHABILITATION PROGRAM

Heijden et al. have pointed out that research background: Exercise might have a persistent effect on energy expenditure and fat oxidation, resulting in increased fat loss. However, even without weight loss, exercise results in positive metabolic effects. The effect of an aerobic exercise program on 24-h total energy expenditure (TEE) and its components—basal (BEE), sleep (SEE), and awake sedentary (SEDEE) energy expenditure and substrate oxidation—has not been studied in lean and obese adolescents. Objective: The objective was to test the hypothesis that 24-h energy expenditure and fat oxidation increase in lean and obese adolescents after 12 wk of moderate aerobic exercise without dietary intervention and weight loss. Design: Twenty-eight post pubertal Hispanic adolescents (13 lean [mean ± SE: age, 15.3 ± 0.3 y; body mass index (BMI; in kg/m2), 20.2 ± 0.7; body fat, 18.7 ± 1.6%] and 15 obese [age, 15.6 ± 0.3 y; BMI, 33.1 ± 0.9; body fat, 38.1 ± 1.4%]) completed a 12-wk aerobic exercise program (4 × 30 min/wk at ≥70% of VO\textsubscript{2} peak) without weight loss. Energy expenditure and substrate oxidation were quantified by 24-h room calorimeter at baseline and post exercise. Results: This aerobic exercise program did not affect 24-h TEE, BEE, SEE, or SEDEE in lean or obese participants. In obese adolescents, respiratory quotient (RQ) and substrate oxidation also did not change. In lean adolescents, 24-h RQ and RQ during SEE decreased (both P < 0.01) and fat oxidation increased (P < 0.01).Conclusions: A 12-wk aerobic exercise program did not increase TEE, BEE, SEE, or SEDEE in either lean or obese sedentary adolescents. Furthermore, 24-h fat oxidation did not change in the obese adolescents, whereas it increased in the lean adolescents.

Faigenbaum \(^{51}\) reported that the prevalence of obesity among children and adolescents is increasing at an alarming rate. If current trends continue, this epidemic will likely pose an unprecedented burden on youth, their families and our health care system. It is important to understand how sensible lifestyle choices such as regular exercise can enhance the health and well-being of obese children and adolescents. While aerobic exercise has traditionally been recommended for obese youth, a growing body of scientific evidence indicates that resistance training can be a safe, effective, and enjoyable method of exercise provided that appropriate training guidelines are followed and qualified instruction is available. In addition to favourable changes in body composition, regular participation in strength-building activities gives obese youth a chance to experience success, feel good about their performances, and gain confidence in their abilities to be physically active. Moreover, participation in resistance exercise gives youth with a high percentage of body fat a chance to be exposed to a form of exercise that can be carried over into adulthood. In this paper, we will discuss the potential benefits of resistance training for obese youth and describe program design considerations for designing resistance training programs for obese children and adolescents.

The prevalence of obesity during childhood and adolescence has reached epidemic proportions worldwide. \(^{41, 52}\) This unabated epidemic is occurring in boys and girls across all socioeconomic strata and it appears that obese children and adolescents are at high risk for becoming obese adults. \(^{14, 27, 29, 31}\) These trends have led some observers to predict that the overall adult life expectancy will decrease due to the increased prevalence of obesity-related co-morbidities such as type 2 diabetes, cardiovascular disease and cancer. \(^{40}\) Today, childhood obesity, with its associated co-morbid conditions and its likelihood of persistence into adulthood, is considered a critical public health threat for the 21st century. \(^{29, 31}\) Learning how sensible lifestyle choices, such as regular exercise, can improve the body composition and enhance the health and well-being of obese children and adolescents is a growing area of interest among health and physical education teachers, researchers, health care providers, and government officials. While both normal weight and obese youth have traditionally been encouraged to participate in aerobic activities such as walking and cycling, over the past two decades a compelling body of evidence has accumulated to indicate that resistance training can be a safe, effective and beneficial method of exercise for all youth regardless of body size. \(^{24, 38, 54}\) Research into the effects of resistance exercise on normal weight and obese children and adolescents has increased over the years, and the qualified acceptance of youth resistance training by medical and fitness organizations has become almost universal. \(^{1, 3, 6, 16}\) This paper discusses the potential benefits of youth resistance training and provides program design considerations for developing resistance training programs for obese children and adolescents. For the purpose of this paper, the term “obese” refers to youth (both children and adolescents) with a body mass index (BMI [weight in kg/height in m\(^2\)]) equal to or greater than the 95th percentile of the age- and gender-specific BMI distribution. \(^{35}\) The term “at risk for obesity” is defined as a BMI at or above the age- and gender-specific 85\(^{th}\) percentile but less than the 95th percentile. The term “resistance training” is defined as a specialized method of physical conditioning that involves the progressive use of a wide range of resistive loads and a variety of training modalities to increase one’s ability to exert or resist force. The term “children” refers to boys and girls who have not yet developed secondary sex characteristics (approximately age 11 in girls and 13 in boys) and the term “adolescence” refers to the period between childhood and adulthood and includes girls 12 to 18 years and boys 14 to 18 years.

Stasiulis\(^{32}\) examined that the objective of the study was to assess changes in body composition, blood lipid and lipoprotein concentrations in 18-24-year-old women during the period of two-month aerobic cycling training. Material and Methods: Young, healthy, non-smoking women (n=19) volunteered to participate in this study. They were divided in two groups: experimental (E, n=10) and control (C, n=9). The subjects of group E exercised 3 times a week with intensity of the first ventilator threshold and duration of 60 min. The group C did not exercise regularly over a two-month period of the experiment. The subjects of group E were tested before and after 2, 4, 6 and 8 weeks of the experiment. The participants of group C were tested twice with an eight-week interval. Results: Body weight, body mass index, body fat mass, and triacylglycerol (TAG) concentration decreased and high-density lipoprotein cholesterol (HDL-ch) concentration increased after the 8-week training program in the experimental group (P<0.05). Blood total cholesterol and low-density lipoprotein cholesterol (LDL-ch) concentrations did not change significantly. Body weight and body mass index started to decrease after 2 weeks of the experiment, but significant changes were observed only after 6 and 8 weeks. Body fat mass was significantly decreased after 2 and 8 weeks of aerobic training. A significant increase in HDL-ch concentration was observed after 4, 6, and 8 weeks. A significant decrease in TAG concentration was observed after 2-week training. No significant changes in all the parameters except TAG (it was slightly increased) were seen in the control group. Conclusions: The two-month aerobic cycling training (within VT1, 60-min duration, three times a week) may induce significant changes in the parameters of body composition--body weight, body mass index, body fat mass, and blood lipids--in young women. The following significant changes were observed: TAG level decreased after 8 weeks. Peak oxygen uptake increased after 4 weeks.

Atlantic\(^{33}\) determined the overweight prevalence among children/adolescents is increasing, while adult obesity may potentially cause a decline in life expectancy. More exercise is uniformly recommended, although treatment efficacy remains unclear. Objective: To determine the efficacy of exercise alone for treating overweight in children/adolescents. Design: A systematic review and meta-analysis of randomized trials published in English were completed following multiple database searches performed on December 10, 2004. Studies of isolated or adjunctive exercise/physical activity treatment in overweight/obese children or adolescents which reported any overweight outcome were included. Literature searches identified 645 papers which were manually searched, of which 45 were considered for inclusion, of which 13 papers which reported 14 studies were included (N=481 overweight boys and girls, aged ~12 years). Two reviewers independently identified relevant papers for potential inclusion and assessed methodological quality. Principal measures of effects included the mean difference (MD) (between treatment and control groups), the weighted MD (WMD), and the standardized MD (SMD). Results: Few studies were of robust design. The pooled SMD was -0.4 (-0.7, -0.1, \(P=0.006\)) for percent body fat, and -0.2 (-0.6, 0.1, \(P=0.07\)) for central obesity outcomes, whereas the pooled WMD was -2.7 kg (-6.1 kg, 0.8 kg, \(P=0.07\)) for body weight, all of which favoured exercise. Pooled effects on body weight were significant and larger for studies of higher doses, whereas non significant and smaller effects were seen for studies of lower doses of exercise (155–180 min/weeks vs 120–150 min/weeks) Conclusions: Based on the small number of short-term randomized trials currently available, an aerobic exercise prescription of 155–180 min/weeks at moderate-to-high intensity is effective for reducing body fat in overweight children/adolescents, but effects on body weight


and central obesity are inconclusive. Recommendations for future study designs are discussed.

U. Narayani and R.L. Sudhan Paul Raj54 considered the aim of the present research was to determine the effect of aerobic training on Percentage of Body Fat, total Cholesterol (TC) and High Density Lipoprotein Cholesterol (HDL-C) among obese women. For this purpose, 20 female obese women (age 17-25) were selected. The subjects received endurance training only one session in the morning between 6-7 am for three alternate days a week for six weeks. To analyse the collected data,’t’-ratio was used at 0.05 level of confidence. The results showed that there were significant changes in Percentage of Body Fat, TC and HDL-C. It was concluded that the aerobic training is widely believed to induce changes in the lipid profiles and Percentage of Body Fat of women.

A. Sahranavard-Gargari55 investigation the aim of this was study the effect aerobic activity on body fat percent in non-athlete girl students. So, among 50 non athlete volunteer students between 18-25- years old, 20 Students who were all healthy selected, and their fat under-skin in these regions were measured by Calliper and then with the use of table of estimating the fat percentage based on age and the amount of under-skin fat in above mentioned three regions excerpted from Raven, the fat percentage of the group was determine. Training consists of 45 minutes aerobic activity (% 70- % 80 heart rate reserves) three times a week. Body fat percent were obtained before and after the 8-week training period. The data was analysis using t-test and we used % 99 probability levels for analysis. This study revealed that localized aerobic activities have been effectual in reducing the fat percentage, and there is a significant difference between average fat percent of objects of exercises group before and after exercises.

Diego Augusto Santos Silva et al56 examined the aim of this study was to evaluate the effect of an aerobic physical exercise program without dietary intervention prescribed with blood lactate levels on body composition and lipid profile of overweight adolescents. A randomized study consisting of pre- and post-treatment tests was conducted on overweight adolescents who were randomly divided into an experimental group submitted to an aerobic exercise program and a control group. The exercise program lasted 12 weeks. After the intervention, a reduction in triceps skin fold thickness, percent body fat and fat mass and an increase in fat-free mass and lipid profile (HDL-c) were observed in the experimental group (p<0.05). These findings indicate a possible reduction in the risk of cardiovascular diseases in overweight adolescents who regularly exercise.

Fatma57 reported the research background: regular physical activity leads to significant changes in terms of the reduction of health-related risks. Research question: The purpose of this study was to investigate the effects of an eight-week step-aerobic dance exercise programme on weight loss and body composition parameters in middle-aged


sedentary obese women. Type of study: This study comprised an eight-week randomised controlled trial. Methods: A total of 49 healthy sedentary obese women participated in this study voluntarily. They were randomly divided into two groups: those undertaking a step-aerobic dance exercise programme (n=29) and a control group (n=20). The subjects too part in a step-aerobic dance exercise programme for one hour per day, three days a week for eight weeks. The subjects' Body Mass Index (BMI), weight, waist circumference, waist-hip ratio, four-site skin fold thickness, fat percentage, basal metabolic rate and lean body mass were assessed before and after the completion of the step-aerobic dance exercise programme. Results: After the eight weeks of the step-aerobic dance exercise programme, significant differences were found in the subjects' weight, BMI, body composition parameters, waist-hip ratio (WHR), waist circumference (WC), fat percentage, lean body mass (LBM) and basal metabolic rate (BMR) in the experimental group (p<0.05). There were no significant differences in the control group after the experiment in terms of the same measures (P>0.05). Conclusion: The step aerobic dance programme proved to be a useful exercise modality for weight loss and in terms of body composition. There was a clear response to the eight-week step aerobic dance programme in terms of central obesity in sedentary obese Turkish women.

Leslie H. Willis et al\textsuperscript{58} made a comparison the recent guidelines on exercise for weight loss and weight maintenance include resistance training as part of the exercise prescription. Yet few studies have compared the effects of similar amounts of aerobic and resistance training on body mass and fat mass in overweight adults. STRRIDE AT/RT, a randomized trial, compared aerobic training, resistance training, and a combination of the two to determine the optimal mode of exercise for obesity reduction. Participants were 119 sedentary, overweight or obese adults who were randomized to one of three 8-mo exercise protocols: 1) RT: resistance training, 2) AT: aerobic training and 3) AT/RT: aerobic and resistance training (combination of AT and RT). Primary outcomes included total body mass, fat mass and lean body mass. The AT and AT/RT groups reduced total body mass and fat mass more than RT ($P < 0.05$), but they were not different from each other. RT and AT/RT increased lean body mass more than AT ($P < 0.05$). While requiring double the time commitment, a program of combined AT and RT did not result in significantly more fat mass or body mass reductions over AT alone. Balancing time commitments against health benefits, it appears that AT is the optimal mode of exercise for reducing fat mass and body mass, while a program including RT is needed for increasing lean mass in middle-aged, overweight/obese individuals.

Patricia CH Wong et al\textsuperscript{59} have pointed out that introduction: Developing effective exercise programmes for the paediatric population is a strategy for decreasing obesity and is expected to help in eventually limiting obesity-associated long-term health and societal impact. In this study, the effects of a 12-week twice weekly additional exercise training, which comprised a combination of circuit-based resistance training and aerobic exercises, in additional to typical physical education sessions, on aerobic fitness, body composition and serum C-reactive protein (CRP) and lipids were analyzed in 13- to 14-year-old obese boys contrasted with a control group. Materials and Methods: Both the exercise group (EG, n = 12) and control group (CG, n = 12) participated in the typical 2 sessions of 40-minute physical education (PE) per week in schools, but only EG participated in additional 2 sessions per week of 45 to 60 minutes per session of exercise training, which comprised a combination of circuit-based resistance training and aerobic exercises maintained at 65\% to 85\% maximum

\textsuperscript{58} Leslie H. Willis et al., “Effects of aerobic and/or resistance training on body mass and fat mass in overweight or obese adults”, \textit{Journal of Applied Physiology} (Published 15 December 2012) Vol. 113 No. 12, Pages 1831-1837.

\textsuperscript{59} Patricia CH Wong et al., “Effects of a 12-week Exercise Training Programme on Aerobic Fitness, Body Composition, Blood Lipids and C-Reactive Protein in Adolescents with Obesity”, \textit{Annals Academy of Medicine} (Singapore, 2008):Vol. 37 No. 4:286-93, Pages 286-293.
heart rate (HRmax = 220 - age). Body composition was measured using dual energy X-ray absorptiometry (DEXA). Fasting serum CRP and blood lipids were analyzed pre- and post exercise programme. Aerobic fitness was measured by an objective laboratory sub-maximal exercise test, PWC170 (Predicted Work Capacity at HR 170 bpm). Results: Exercise training significantly improved lean muscle mass, body mass index, fitness, resting HR, systolic blood pressure and triglycerides in EG. Serum CRP concentrations were elevated at baseline in both groups, but training did not result in a change in CRP levels. In the CG, body weight increased significantly at the end of the 12-week period. Conclusion: This study supports the value of an additional exercise training programme, beyond the typical twice weekly physical education classes, to produce physiological benefits in the management of obesity in adolescents, including prevention of weight gain.

Vivek G. Awasare

examined the main purpose of the study was to see the effect of aerobics exercises on physical fitness and body composition of school boys. The selected 40 student were equally divided into two equal groups consisting 20 subjects in each group assigned in experimental and control groups. The pre and post test were significantly different saw on conducted on the physical fitness variables, abdominal strength, speed and cardiovascular endurance and body composition.

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conducted the background: The prevalence of children obesity is raising alarmingly in both developed and developing countries developing effective exercise programs are a strategy for decreasing this prevalence and limiting obesity-associated long-term comorbidities. Objectives: To determine whether 16-week training program; in addition to the school physical education and without dietary intervention; could have beneficial effects on body composition and aerobic capacity of obese children. Materials and Methods: Twenty-eight obese children (16 boys, 12 girls; aged 12-14 years) were enrolled and were divided into either the exercise group (EG, n = 14) or the control group (CG, n = 14). EG participated in a 16-week aerobic exercises (four 60-min sessions per week at 70-85% of HRmax (maximum heart rate)), in addition to the school physical education. Fat-Free Mass (FFM) and Fat Mass (FM) were assessed with bioelectrical impedance equipment. To assess aerobic capacity, maximal metabolic equivalent of task (MET-max) and maximal workload (W-max) were estimated with an electronically braked cycle ergometer (type Ergo line 500). Results: At baseline, there were no differences between the two groups. After the training program, only the EG showed significant reduction in BMI (body mass index) and waist circumference compared with the baseline values (P < 0.001). Exercise training significantly decreased FM only in the EG. A significant increase in FFM was seen in both groups; more marked in the EG. There was a significant increase in MET-max (P < 0.05) and W-max (P = 0.02) in the EG, and no significant changes in these parameters were seen in the CG. HRmax significantly decreased only in the EG (P < 0.05). Conclusion: This training program has beneficial effects on body composition and aerobic capacity parameters in obese children. Our intervention has the advantage of providing a sustainable and reproducible school and community approach for the management of children obesity.

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studied the effect of Moderate and High Intensity Aerobic Exercise on the Body Composition of Overweight. The optimal aerobic exercise training intensity to

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improve body composition in overweight men is unclear. The purpose of this study was to determine the effect of 14 weeks of high intensity versus moderate intensity aerobic exercise of equal work output on body composition in overweight men (BMI = 25-29.9 kg/m²). Sixteen sedentary military men (18 - 33 yrs) were randomized in two equal groups (n=8): 1) moderate intensity exercise (MI; 60 - 70% of their maximum heart rate; HRmax), and 2) high intensity exercise (HI; 75 - 90% HRmax) The aerobic exercise (jogging/running) training program was performed three days/wk. Relative body fat (% BF) was assessed by dual energy x-ray absorptiometry (DXA) (Lunar DPX - IQ). Significant differences between and within the groups were analyzed using a two-way split-plot analysis of variance (SPANOVA). Statistical significance was accepted at p<0.05. After the 14 wks of the aerobic exercise program the mean %BF of the HI significantly (p<0.05) decreased to 22.49 % (Δ=4.91%). The decrease in mean %BF (Δ=1.4 %) in the MI was not significant (p>0.05). It is concluded that 14 wks of HI aerobic exercise may be more effective in improving body composition than MI aerobic exercise in overweight young military men with physical characteristics similar to the present study.

Pantelic Sasa et al.63 investigation the aim of this study was to determine the effects of a twelve-week aerobic dance-training program on the body composition parameters of young women. The sample of 59 young women belonged to one of two groups, an experimental (EXP) or a control (CON) group. The experimental group consisted of 29 female subjects (age 23.1±1.9 years, body height 164.4±6.1 cm, body weight 62.1±5.6 kg, BMI 23.0±2.2 kg/m²), while the control group was made up of 30 subjects (age 22.7±1.8 years, body height 165.3±6.2 cm, body weight 59.4±6.3 kg, BMI 21.7±1.7 kg/m²). To assess body compositions, the following measures were used: the overall sum of the upper body skin folds, the overall sum of the lower body skin folds, the overall sum of skin folds of the upper and lower body, the percentage of body fat, the percentage of muscle mass in the body, body height and body weight. For all of the sums of skin folds for the subjects of the EXP group, we noted a statistically significant decrease (p< 0.05) at the final measuring in relation to the initial measuring (SFUPPER - 39.35 mm compared to 42.87 mm; SFLOWER - 39.35mm compared to 49.88 mm; TOTAL SF - 76.97 mm compared to 92.75 mm). In the case of BF%, a decrease was noted at the final measuring in relation to the initial one (20.37% compared to 22.66%), which was statistically significant (p< 0.05). On the basis of our results, we can conclude that aerobic dance decreases subcutaneous fatty tissue and body composition of the young women.

Sohaily Shahram64 examined the Obesity increases the risk of various diseases. Leptin and insulin are hormones that are involved in regulating and balancing body weight and obesity. This research aims to explore the impact of intermittent exercise on serum concentration of leptin and insulin resistance in overweight female students. For this purpose, 30 female overweight volunteer students (BMI ≥ 26) of Azad University Parand Campus were selected and randomly divided into two groups: intermittent training group and control group. Training groups exercised for 12 weeks, three sessions a week with definite intensity and distance. Leptin, insulin, glucose, body weight, fat percentage, BMI And maximum oxygen consumption were measured both before and after the 12-week exercise. Using Independent T-test, the results showed that interval training had significant effect on leptin, insulin resistance index, body weight, fat percentage, BMI and maximum oxygen consumption (p ≤ 0.05). Therefore our findings support the hypothesis that intermittent exercise leads to significant decrease of leptin levels and insulin resistance.


Song J K\textsuperscript{65} reported that the Aim: This study tested the hypothesis that 12 weeks of air board exercise would enhance cardio respiratory fitness and vascular compliance and reduce \% body fat in obese Korean boys. Methods: Twenty-two obese boys (>30\% body fat) were studied. They were divided into 2 groups- an aerobic exercise group (N.=12), which trained 3 days/week, 50 min/day for 12 weeks, and a control group (N.=10). Control subjects only performed activities involved in their physical education classes. Body composition, cardiovascular fitness (20 m multistage endurance test performance) and vascular compliance were assessed before and after the completion of exercise training. Results: The \% changes in body fat (-4.6±0.9 vs. -1.5±1.0\%), fat mass (-5.4±1.5 vs. -0.1±1.6\%) and performance on the cardiovascular fitness test (14.3±2.5 vs. 3.7±1.6\%) were greater in the exercise group than in the controls Compared to controls, \% increases in vascular compliance were greater in the arms and legs of the exercise group (left arm: 2.8±0.5 vs. 2.0±2.9\%; left leg: 2.6±1.2 vs. -0.5±2.0\%; right arm: 2.9±0.9 vs. 0.3±2.9\%; right leg: 4.8±1.8 vs. 1.5±2.0\%). Conclusion: Results suggest that exercise training can reduce \% body fat and enhance vascular compliance in obese male adolescents; changes that may reduce the risk for later development of cardiovascular disease.

**REVIEW OF RELATED LITERATURE OF SWISS BALL EXERCISE REHABILITATION PROGRAM**

Kelly Kalovcak \textsuperscript{66} considered the Childhood obesity is a significant public health problem, and school-based interventions offer opportunities to reach children. We examined the feasibility of using stability balls, as compared to traditional desk chairs, in elementary school classrooms testing effects on vital signs and BMI. Forty-seven fourth graders from two classrooms participated: twenty-seven using balls and 20 using chairs over a 45 day period from the beginning to the end of the second quarter of school. Overall, children welcomed using stability balls and over 90\% reported improvement of the classroom’s learning environment. No significant difference was found in BMI percentile (p = 0.726), systolic (p = 0.148) or diastolic (p = 0.747) blood pressure percentiles, or resting pulse (p=0.977) between the two classrooms.

Aarti Welling and Peeyoosha Nitsure\textsuperscript{67} have pointed out that the background & objective: Obesity refers to a condition of having excessive amount of body fat. Not only the amount of excess fat needs to be considered but where in the body it is distributed is also of importance. The intra-abdominal fats carry a greater health risk than that stored elsewhere in the body. Various exercises have been designed for obesity but in particular the exercises designed for abdomen are using mat, Swiss ball and theraband exercises. However, there is dearth in literature as to indicate which of the 3 is better and more effective. Hence, the study was conducted with the objective to study the comparative effect of 5 week training program between Mat, Swiss ball and theraband exercises on abdominal girth and skin fold thickness. Methods: Sixty healthy individual aged 18 to 40 years were randomly assigned to all of 3 groups. Mat (n=20), Swiss ball (n=20) and theraband (n=20). Pre and post assessment was done using BMI, waist circumference, waist hip ratio and abdominal skin fold thickness. Results: Within group analysis in all the three groups showed statistically significant


reduction in all outcome (p<0.001). Between groups analysis showed no significant difference between the 3 groups. Conclusion: The results reflected that 5 week exercise program on mat, swiss ball and theraband are equally effective in reducing abdominal fat.

Kulroop Kaur Badwal; Ranjit Singh investigation the purpose of this study was to explore the effect of short-term swiss ball training on aerobic capacity, body composition and upper body strength & endurance. For the purpose of the present study, twenty four (N = 24) male subjects between the age group of 18-27 years (Mean Â± SD: age 23.29 Â± 2.15 years, height 1.62 Â± 0.021 m, body mass 56.75 Â± 4.24 kg) were selected as subjects. The subjects were purposively assigned into two groups: Group-A: Experimental (N1 = 12) and Group-B: Control (N2 = 12). The subjects from Group-A were subjected to 4-week of Swiss ball training. The training consisted of a variety of exercises (i.e., Pelvic Tilt, Abdominal Crunch, Supine Bridge and Roll, Squat). It is concluded that the aerobic capacity, body composition and upper body strength and endurance significantly improved in experimental group compared with the control one. Student's t-test for independent data was used to assess the between-group differences and for dependent data to assess the Post-Pre differences. In all the analyses, the 5% critical level (p < 0.05) was considered to indicate statistical significance. The swiss ball exercises training may be recommended to improve aerobic capacity, body composition and upper body strength and endurance to enhance physical fitness based performance.

Gulsum Bastug et al. determined the purpose of this study was to investigate body composition and body image of women doing Cross-Fit, Pilates and Zumba exercises. Material and Methods: This study was carried out to investigate body composition and body areas satisfaction of women doing Cross-Fit, Pilates and Zumba exercises, 80 women voluntarily being in an average age of 42.74±8.47 voluntarily participated in the research. The women were grouped into two such as experimental (n=45) and control (n=35). The women in experimental group were applied 30-70min mixed exercises (Cross-Fit, Plates, Zumba) for 4 days in a week throughout 12 weeks to have target heart rate of 50-60%. Results: A significant difference was found between body weight and BMI pre-test and post-test values of women who were applied mixed exercise program (Cross-Fit, Pilates, Zumba). There was a decrease in both body weight and average means of BMI of women. A significant difference was found between body areas satisfaction pre-test and post-test values of women who were applied Cross-Fit, Pilates, Zumba exercise program. While pre-test value of body areas satisfaction of women who were applied mixed exercise program was determined as 31.68±6.11, its post-test value was 35.68±5.02. It is remarkable that while body weight and BMI of women doing exercises decreased, their body areas satisfaction values increased. It was indicated that the body areas satisfaction of women having weight loss increased. A significant difference was not found between body weight, BMI and body areas satisfaction pre-test and post-test values of women in control group. Conclusion: It was concluded that there were positive effects on body weight, BMI and body image.

Aruna Raj A and Pramod K G. investigation the purpose of these study 135 female hostel students were tested body composition by using Tanita body composition Analyzer from Pondicherry University; from that group 54 students were selected on the basis of fat
free mass. Their age ranged from 19 to 25 years. The selected 54 subjects were divided into three equal groups, two experimental groups and one control group each group consisting of 18 subjects. Experimental group I underwent Yogasana practice, group II underwent Swiss ball training and group III act as control group who did not participated any training program except their daily routine. The training program schedule was one session in the evening between 6.00 pm to 7.00 pm for five days per week for the period of twelve weeks. The yoga program includes prayer, loosening exercises, various asana, and relaxation and Swiss ball training includes 15 minutes warm up, 30 minutes Swiss ball work outs and 15 minutes cooling down. FFM and fat mass were tested by using Tanita body composition analyzer before and after the training program for both experimental and control groups. Analysis of covariance (ANCOVA) was applied to determine the significance difference between the groups by using SPSS 16 version. Whenever the F ratio for adjusted post test mean was found to be significant, the Scheffe’s test was applied as post hoc test to determine the paired mean differences. For all analysis the level of confidence was fixed at 0.05. Discussion: The result of the present study showed that the fat free mass and fat mass was significantly changed after twelve weeks of Swiss ball exercises and Yogasana practices when compared with the control group. Due to training the selected body composition such as fat free mass is increased in both training group where as fat mass is reduced after the training program. Than the Yogasana practice group. The present study result was supported by following authors Telles et al., (Jan 2010), Pal et al., (June 2011). Chen and Tseng (2008). In Swiss ball training muscles are worked more when compared with yoga practices. In yoga is a slow and steady process, it will take more time than Swiss ball training in body composition. Both training is advisable for reducing fat content in the body Conclusion: (1) There was a significant difference among Swiss ball exercises and yogic practices on fat mass than the control group after twelve weeks of yogasana practice and Swiss ball training. (2) There was a significant difference among swissball exercises and yogic practices on fat free mass than the control group after twelve weeks of yogasana practice and swissball training. (3) There was no significant difference between swissball exercises and yogic practices group on body composition after the twelve weeks of training period.

Byoung-Do Seo et al. examined the effect of a Swiss ball exercise program for elderly females on physical fitness and balance ability in order to offer basic data for the development of an exercise program to improve the quality of life and promote the health of elderly females. [Subjects] Sixty-five elderly women aged over 78 participated in this study. [Methods] The subjects were divided into two groups: an exercise group and a control group. The exercise group (n=38) performed a Swiss ball exercise program which consisted of 12 types of exercises required for balance and performance of functions twice a week for 12 weeks. Physical fitness (Sit-to-Stand, Arm Curl, Sit-and-Reach, Back Scratch) and balance ability (One-Legged Standing time, Timed Up & Go) were evaluated. [Results] There was a significant increase in the physical fitness and balance ability of the exercise group. [Conclusion] The Swiss ball exercise program had a positive effect on physical fitness and balance ability of elderly women. We consider that the ball which is easy, safe and interesting to use will encourage the elderly’s active participation in exercise.

Parvadia reported the purpose of the present study was to find out the effect of selected Swiss ball abs exercise on body fat percentage of overweight people. The sample of 30 overweight male between the ages 20-30 years were selected from the general population of Bapunagar area Ahmedabad Gujarat, India. And the selected subjects were divided into

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two groups i.e. 15 as Swiss ball Exercise group (Experimental) and 15 as Control group. In the present study purposive -random sampling technique was used to select the sample. For measuring body fat percentage the body Composition Analyzer and WHO's BMI norms table were used. The BMI was calculated easily from the following formula BMI= (Weight in kg /Square of height in meters). After assessment of pre-test of both groups then after experimental treatment Swiss ball abs exercise programme was conducted for 15 weeks. After the completion of 15 weeks Swiss ball abs exercise training, the post test (measure body fat percentage) was conducted to know the significance difference between both group (Swiss ball abs exercise group and control group). The ‘t’ test was applied to analyses the data. Statistically significant effect of Swiss ball abs exercise group was great improvement found on body fat percentage of experimental group II as compared to control Group I at. 05 level of significance.

REVIEW OF RELATED LITERATURE OF PILATES EXERCISE REHABILITATION PROGRAM

Aladro Gonzalvo et al. reported objective: The purpose of this systematic review was to determine how Pilates exercises have impacted body composition (BC) on selected populations. Methods: A comprehensive literature search was performed using the keywords ‘Pilates, body composition, systematic review, literature review, overweight, obesity, healthy weight, underweight’ and their combination. Results: Seven studies met the inclusion criteria and after further quality analyses it was determined that there is currently poor empirical quantitative evidence indicating a positive effect of Pilates exercises on BC. Several methodological flaws were observed in the studies analyzed, including few full-text published studies looking into the effects of Pilates exercises on BC, a lack of true experimental research designs, limited standardization in measurement techniques, insufficient or no control of the nutritional status, and inconsistent instructor qualifications. Conclusion: Well-designed research is needed to determine how Pilates exercises impact BC on selected populations.

Segal N A has pointed out that the effects of Pilates training on flexibility and body composition: an observational study. Objective: To assess claims regarding the effects of Pilates training on flexibility, body composition, and health status. Design: An observational prospective study. Setting: A community athletic club. Participants: A sample of 47 adults (45 women, 2 men) who presented for Pilates training. Interventions: Not applicable. Main outcome measures: Fingertip-to-floor distance, truncal lean body mass by bioelectric impedance, health status by questionnaire and visual analogue scale were assessed at baseline, 2, 4, and 6 months (±1wk). Results: Thirty-two of 47 enrolled subjects met the protocol requirements of missing no more than 1 weekly 1-hour session Pilates mat class during each 2-month period. Investigators were blinded to measurements from previous time points. Median (Inter quartile range [IQR]) fingertip-to-floor distance improved from baseline by 3.4cm (1.3–5.7cm), 3.3cm (0.3– 7.8cm), and 4.3cm (1.5–7.6cm) at 2, 4, and 6 months, respectively (paired nonparametric analysis, all P<.01). There were no statistically significant changes in truncal lean body mass, height, weight, or other body composition parameters. Self-assessment of health also did not change in a statistically significant manner from its baseline median (IQR) value of 77mm (69–85mm). Conclusions: Pilates training may result in improved flexibility. However, its effects on body composition, health status, and posture


are more limited and may be difficult to establish. Further study might involve larger sample sizes, comparison with an appropriate control group, and assessment of motor unit recruitment as well as strength of truncal stabilizers.

Russell Jago\textsuperscript{75} considered the research background: There is a need to find ways to increase the physical activity levels and improve the body composition and blood pressure of girls. Methods: Thirty 11-year-old girls were recruited from two after school programs in Houston Texas in Spring 2005. Participants from one program (16) were randomly assigned to intervention, the other (14) served as controls. BMI, BMI percentile, waist circumference and blood pressure were assessed before and after the intervention. Pilates classes were provided free of charge for an hour per day at the intervention site, 5 days a week, for 4 weeks. Four participants wore heart rate monitors during every session and completed enjoyment and perceived exertion questionnaires. Repeated measures analysis of variance with time (within) and group (between) as factors was performed. Results: Mean attendance was 75\%, mean heart rate 104 bpm, mean perceived exertion 5.9 (1–10 scale) and enjoyment 4.4 (1–5 scale). There was a significant ($P = 0.039$) time by group interaction for BMI percentile. Graphs indicated that this difference was influenced by large reductions in the BMI percentile of healthy girls. Conclusions: Girls enjoyed Pilates, and participation for 4 weeks lowered BMI percentile. Pilates holds promise as a means of reducing obesity.

Lu Yan and Zhang Shanbin\textsuperscript{76} studied the effect to understand the Pilates physical exercises physiological indicators of female college students (body shape, fitness, physical function), and further explore the Pilates exercises on physical fitness of female university students and its mechanism, this study randomly selected school 60 female college students (age 19.12±1.08), one of the control group (n=30) for normal learning and living, and the experimental group (n=30) were carried out in a 16-week Pilates physical exercises. Laboratory tests show: after 16 weeks of the Pilates physical exercises, one of the vital capacity to increase from 2430.7±429 to 3071.68±408, waist skin fold thickness decreased from 14.55±2.75 to 12.28±3.01, sit and reach from 11.61±5.47 to 17.94±5.18. Female college students can be drawn through Pilates physical exercises before and after cardio-pulmonary function, body fat, flexibility and other indicators of significant difference.

According to O. Cakmakci\textsuperscript{77} reported the objective of this study was to explore the effects of 8-weeks modern Pilates’ mat and ball exercise program on body mass, waist circumference and waist to hip ratio on sedentary obese women total of 58 health sedentary obese women volunteered to participate in this study. They were divided randomly into 1 of 2 groups: Pilates training group (PTG; N=34) and control group (CG; N=27). A Pilates training program was applied to the subjects one hour per day four days per week during 8 weeks. The subjects in the control group did not participate in the training and participated only in the pre and post test measurements. BMI, waist circumference, Waist-hip ratio, 4-site skin fold thickness (Biceps, Triceps, Sup scapula and Iliac), fat percentage, resting metabolic rate, Lean body mass and flexibility were assessed before and after the Pilates training program. The SPSS statistical program (version 16.0) was used for data analysis. Analyses of covariance (ANCOVAs) were run on each of the dependent variables. For all analyses, the criterion for significance was set at an alpha level of $p<0.05$. 8 weeks of Pilates training program has been found to be effective on weight, Body mass index, Lean body mass, waist-hip ratio, biceps,


triceps, fat percentage, basal metabolic rate, and flexibility in PTG (p<0.05). The control group showed no significant differences in the same measures post-intervention. As a result there was a positive effect of Modern Pilates mat and ball exercises of reducing obesity, body composition parameters and flexibility at sedentary obese women.

Ruiz- Montero⁷⁸ reported the background: The purpose of this study was to examine the differences in anthropometric measurements using an aerobic and Pilates exercise program which lasted 24 weeks. Method: This was a clinical intervention study of 303 women over the age of 60 living in Novi Sad, Serbia. Changes in body mass index and skin fold thickness were estimated through height, weight, and anthropometric measurements. The program comprised Pilate’s exercises for upper- and lower-body strength, agility, and aerobic capacity. Results: Fat mass (FM) improved significantly (pre-test, 32.89%, 8.65; post-test, 28.25%, 6.58; P<0.01). Bone diameters and muscle perimeters showed no significant changes pre- and post-test (P>0.05), but there was a higher correlation between FM (%) and waist–hip ratio (rho, 0.80; P<0.01). Conclusion: A mixed program of aerobics and Pilates controls and improves baseline muscle mass and decreases FM values, without causing deterioration during practice and follow-up exercises.

M Fourie⁷⁹ has pointed out the research background: With ageing, the ability to mobilize fat is reduced and this, coupled with gradual decrease in lean body mass (LBM) from lessened exercise, allows for an increased body fat percentage (%BF). Exercising is considered a key to maintaining an appropriate body mass (BM), as it improves fat oxidation, while maintaining LBM. Although the effects of endurance and/or resistance training on fat mass (FM) and LBM in the elderly have well been established, limited data are forthcoming regarding the effects of Pilates as a training modality on these variables in the elderly. Objective: The present study was therefore conducted to determine the effects of a mat Pilates programme on body fat in elderly women. Methods: Fifty sedentary, apparently healthy females aged 60 years and older were randomly assigned a control (CG, n = 25) or an intervention (IG, n = 25) group. The IG took part in an eight-week progressive mat Pilates exercise programme, three times weekly while the CG were instructed to maintain their normal daily activities throughout the eight-week experimental period. All subjects underwent pre- and post-test in which FM and LBM were assessed. Results: Eight weeks of mat Pilates demonstrated a significant (p < 0.05) decrease in % BF (p = 0.016) and FM (p = 0.038), with a significant increase in LBM (p = 0.006), while not showing any significant changes (p > 0.05) in BM (p = 0.979) and BMI (p = 0.992). The CG, however, did not produce any significant (p > 0.05) changes in any of the tested anthropometric variables (BM: p = 0.266; BMI: p = 0.123; % BF: p = 0.516; FM: p = 0.937 and LBM: (p = 0.522) after completion of the eight-week Pilates programme. Conclusion: An eight-week mat Pilates exercise programme may contradict or even reverse some of the most serious consequences of ageing associated with an increased fat mass and reduced lean body mass in elderly females.

Anne and Marcello⁸⁰ examined the changes in body composition (fat mass and lean body mass) related to an aerobic-Pilates program in elderly Serbian women. The authors concluded that “a combined program of aerobic and Pilates, carried out under the supervision of an instructor, at least twice a week, produces health benefits in functionally independent women over the age of 60”. This conclusion is overly optimistic and not supported by the

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evidence provided. The authors used an uncontrolled study design so that, by definition, the observed changes in anthropometric endpoints can at best be interpreted as preliminary evidence of the effectiveness of the exercise program. Further, the evidence provided for the effectiveness of the exercise program is very weak. The authors attributed the changes in outcomes to the exercise program, but ignored the potential effect of the imposed study diet, health education, and other factors that may have independently affected the anthropometric outcomes. The endpoints chosen by the authors are surrogate outcomes, not patient relevant outcomes, so it is incorrect to refer to health benefits. With the exception of the waist-to-thigh ratio, imprecise thus not statistically significant changes were observed in muscle perimeters (ten outcomes), skin fold thickness (seven outcomes), and bone measurements (four outcomes). However, the authors inaccurately report “As for skin fold thickness, various results were obtained (P<0.05)”, and fail to address the problem of multiple testing in their discussion. In contrast, the observed change in fat mass may be of interest, but the clinical relevance of the magnitude of this finding is not discussed, nor is it put in context with the imposed study diet or other confounding factors. In conclusion, the authors seem to base their conclusions on an incorrect interpretation of their data, providing yet another example for the necessity of multidisciplinary collaborations, where at least health care specialists, biostatisticians, and methodologists team up to design, conduct, and report clinically meaningful research.

REVIEW OF RELATED LITERATURE OF GYMNASTICS FLOOR REHABILITATION PROGRAM

Brendon Gurd, Panagiota Klentrou have evaluated the purpose of this study was to evaluate the effect of intense training on physical growth and sexual maturation in young male gymnasts. Physical development, pubertal development, testosterone levels, energy expenditure, and relative body fat were examined in 21 circumpubertal male gymnasts (13.3 ± 0.3 yr) and 24 age-matched controls (13.5 ± 0.3 yr). Subjects completed a self-assessment of genital and pubic hair development with the use of the Tanner scale. All subjects were measured for height, weight, and salivary testosterone levels (T). The Physical Activity Questionnaire for Adolescents was used to estimate weekly energy expenditure in metabolic equivalents. Percent body fat (%BF) was assessed by using bioelectrical impedance analysis. Developmental stages and T, as well as height and weight, were not different between groups. Energy expenditure was significantly higher (P ≤ 0.05) and %BF was lower (P ≤ 0.05) in athletes than in controls, but lean body mass was not significantly different between groups. Energy expenditure was negatively correlated (P ≤ 0.05) with %BF but not related to T. Developmental stages were strongly (P ≤ 0.05) related to T but not to energy expenditure or %BF. It is concluded that, although there is a higher energy expenditure accompanying intense training in young male athletes, their body composition is not necessarily affected, and there is no determined effect on their physical and pubertal development.

Erlandson, Marta Christine reported the dramatic rise in health care and economic costs as well as increases in morbidity and mortality related to lifestyle behaviours and non-communicable diseases have resulted in an increasing emphasis on research and intervention initiatives aimed at primary prevention. As there is growing evidence that the antecedents of adult diseases such as obesity and osteoporosis have roots in early childhood, physical activity interventions in early childhood (4 to 6 years of age), which has been identified as a


critical period, may influence the development of fat and bone mass at this young age and have a potential impact on adolescent and young adult health status and thus improve population health. The intent of this study was to investigate the effects of structured physical activity, specifically early involvement in gymnastics, on early childhood body composition development. Sixty three (25 male and 38 female) 4 to 6 year old children participating in gymnastics programs were compared to 95 control (49 male and 46 female) children. Anthropometric measurements included height, weight, BMI, waist circumference, and skin fold thickness. Dual energy x-ray absorptiometry (DXA) was used to measure whole body bone density and fat mass. Physical activity, physical inactivity, dietary intake, and birth weight of the participants as well as parental heights and weights were also obtained. No significant differences were found, at any age, between the groups in height, weight, BMI, waist circumference, skin fold thickness, physical activity, physical inactivity, dietary intake, and birth weight or in parental heights and weights (p>0.05). Additionally, there were no significant differences in fat and bone parameters once the confounders of age and size were controlled (p>0.05). This investigation found that young children entering a gymnastics program did not differ in either bone mass or fat mass compared to controls. This was surprising as differences in these parameters have been found in adolescent gymnasts. Thus my results indicate that the potential effects of gymnastics training may have not yet manifested themselves. To answer this question longitudinal measures are required to ascertain whether the body composition differences observed in adolescent gymnasts are due to prolonged exposure to gymnastics involvement.

Emma M. Laing et al. made a comparison the objective: to examine changes in bone and body composition of adolescent female artistic gymnasts (GYM; n = 7), level 5+, compared with non gymnast controls (CON; n = 10) over 3 years. Study design: Areal bone mineral density (aBMD; g/cm²), bone mineral content (BMC; g) and bone area (cm²), of the total body (TB), total proximal femur (TPF), trochanter (Tr), femoral neck, lumbar spine (LS), and distal radius were measured using dual-energy X-ray absorptiometry. Fat-free soft tissue mass (FFST; g), fat mass (g), and percent body fat (%FAT) were also assessed. Results: No initial differences in height or weight between GYM and CON were observed, and both groups demonstrated parallel increases in these parameters over time (P <.05; h² ≥0.15). At baseline, GYM possessed significantly lower %FAT and higher aBMD at all sites (except TB; P <.05; h² ≥0.15). Over 3 years, GYM increased more than CON (P<.05; η² ≥0.15) in TB, Tr, and TPF aBMD, TB and LS BMC, and FFST. Conclusion: Female adolescents participating in competitive artistic gymnastics training over 3 years have enhanced rates of aBMD, BMC and FFST accrual. (Journal Pediatrics 2002; 141: 211-6)

I.C. Elendu and O.A. Umeakuka examined a cross-sectional survey design was used to explore the weight-loss practices among gymnasts in Rivers State, Nigeria. Data were collected from eighteen gymnasts using 11-item structured questionnaire. The generated data were analyzed using percentage and chi-square statistics. Results showed that majority of the gymnasts decreased their consumption of calories (77.78%), increased their expenditure of calories through exercise (88.89%), restrict food (94.44%), over-exercise (83.33%) and engage in voluntary fluid reduction or dehydration (83.33%) to lose weight. Among the findings was that the gymnasts' gender, age and years of sporting experience had significant influence on increase expenditure of calories through exercise, food restriction, use of drugs, use of nutritional supplements and use of steam baths or saunas for weight-loss. Among the

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recommendations are that nutritionist/dieticians should be employed and integrated into the gymnastics team to provide and guide the gymnasts on how to effectively use healthy and supervised nutrition to lose weight. The gymnasts should be educated on the health and performance effects of engaging in harmful weight-loss practices through seminars. Stakeholders should be sensitized on the weight-loss practices. This will enable them to discourage any gymnast planning to adopt unhealthy weight loss measures.

Alfredo Irurtia Amigoa et al. 85 reported introduction and aims: The aim of the present study was to characterize the evolution of height and weight (from 7 to 25 years old) and somatotype and body composition (from 12 to 18 years old) in elite male gymnasts. Method: For each of the variables, a mixed-longitudinal design was used to analyze: a) its evolution with age and b) its differences with respect to a reference population. Somatotype was analyzed with the Heath-Carter method, fat free mass with the Slaughter formula and muscle mass with the Portman formula. Results: Male gymnasts were significantly shorter and lighter than the reference population. The best gymnasts were even more so with respect to their fellow gymnasts, except for specialists in vault and floor where the lower limbs are especially important. The peak height velocity occurred at the age of 14, at the same age as in the reference population. The somatotype was ecto-mesomorphic in 90% of the gymnasts. Fat mass percentage was significantly lower than in the reference population. Somatotype, fat free mass and muscle mass showed no significant increases with age. Conclusions: Gymnasts showed a growth pattern considered as normal in the variables analyzed in the present study. The main differences between the gymnasts and the reference group were observed from the beginning of the follow-up. These findings suggest the effects of a selection process, both before and during the training process, before the elite level is reached.

Haitao Chen et al.86 investigated for top level female gymnasts; effective body fat reduction is a long-term process, often resulting in various issues; how to keep the physical fitness at an optimal level? How to control the amount of training to improve skill and performance? This report presents a case study of a successful weight loss program used by the Chinese National Gymnastics Team when preparing for the 2008 Olympic Games. Results: Over 28 days the participant lost 840 grams of body weight, of this 356 grams were fat. The participant achieved the optimal balance between fitness and body weight. She developed a desirable mental condition for competition and managed to achieve a respectable result at the 2008 Olympic Games. Conclusion: In conclusion, the results of this study suggest that body weight control is an important aspect for elite gymnasts in preparation for competition. The regulation of food intake and energy balance contributes to the optimal body weight for performance. Further studies are needed for body weight management of the top level gymnasts.

Sule Kirba and Sedef Kurt87 have pointed out that the study aims at identifying the impact of three to six month-programs for step aerobics and aerobic gymnastics on sedentary women's anthropometric measurements. This study covered a total of 44 volunteer women who have never done exercise before and with the average age of 38.25±6.43 years, the average height of 162.04±5.53 cm and the average weight of 69.88±14.61 kg. The 1st group is composed of 20 participants while the 2nd group consists of 24 participants. Those who did


exercise for three months make up the 1st Group whereas the 2nd Group is composed of those who did exercise for six months. At the heart rate of 50-60 %, the 1st group was made to do exercise for 60 minutes and 3 days a week during a 12-week span as the 2nd group did exercise for 60 minutes and 3 days a week during a 24-week span. The 1-hour exercise program includes 5-minute warming up, 15-minute aerobics, 20-minute step aerobics, 15-minute floor gymnastics and 5-minute cooling down. The intensity of the exercise was determined by identifying the target heart rate in accordance with the heart rate reserve method (Karvonen). The subjects were measured in weight, height and body mass % on a Tanita scale. The statistical analysis of the data acquired was conducted by the SPSS package program. The groups were compared on a paired simple t-test. P<0.05 was deemed significant. It was concluded from the study on comparison of the groups that the age and VFR 2 scores were statistically significant at the level of p<0.01 and p<0.05 respectively. There was no statistically significant difference between other variables in spite of some numerical differences (p>0.05). As a conclusion, the age difference between two groups indicates that people tend to exercise less as they grow older and that results from the decline in regular exercise in the society as people age. The numerical values indicate that doing exercise has a positive impact on women's body mass % whereas no statistically significant result and instability in values result from subjects' age range, constantly sitting down at work, metabolic or hormonal reasons, malnutrition and social habits.

**REVIEW OF RELATED LITERATURE OF AQUATICS EXERCISE REHABILITATION PROGRAM**

Joanna Kantyka et al. 88 examined purpose: the aim of the present investigations was to determine the effects of aqua aerobics on body weight and composition, lipid profile, and selected blood count parameters in middle-aged sedentary females. Methods: Twenty-one women were randomly assigned to an experimental group (age 56.20± 2.57 years, height 162.80± 4.76 cm, weight 74.03± 3.84 kg) that participated in aqua aerobics classes three times a week for three months and a control group (mean age 56.4± 3.28 years, height 165.00± 3.91 cm, weight 70.01± 11.36 kg) not involved in any kind of targeted exercise. The aqua aerobics classes were tailored to suit the age and abilities of the participants, with workout intensity controlled and maintained at approximately 128–137 bpm. Results: Significant differences between the experimental and control groups were found for body weight, total body water, fat-free mass, and skeletal muscle mass. A significant increase in post-intervention hemoglobin and erythrocyte counts was observed in the experimental group. Conclusions: Future studies should determine the intensity of physical activity with the most beneficial effect on blood variables in middle-aged and older individuals.

Bo-Ae Lee and Deuk-Ja Oh 89 investigation the purpose of this study was to investigate the effects of aquatic exercise on body composition, physical fitness, and vascular compliance of obese elementary school students. For the purpose of this study, 20 obese elementary students were selected as subjects. The subjects were then divided into two groups: the swimming group (n= 10) and the control group (n= 10). The subjects were asked to exercise for 60 minutes a day, 3 times a week for 12 weeks with an exercise intensity of 50–70% HRmax. The following results were achieved: first, in terms of body composition, both body fat percentage and fat-free mass showed significant differences within the swimming group. There were also significant differences again in the post test of difference 88 Joanna Kantyka et al., “Effects of aqua aerobics on body composition, body mass, lipid profile, and blood count in middle-aged sedentary women”, Human Movement (2015): Volume 16 (1), Pages 9-14.

between the two groups. Second, in terms of changes in physical fitness, there were, again, no significant changes in muscular strength between the two groups. However, muscular endurance, flexibility, and cardiopulmonary endurance showed significant differences in the swimming group’s test for difference within groups. Significant differences in both groups for the posttest of differences between groups were also seen. Third, in terms of vascular compliance, there was a significant increase in the right leg for the swimming groups’ test of difference within groups, as well as in the post test of difference between groups.

Gappmaier E. et al\textsuperscript{90} reported the aim: It has been suggested, that water exercise is less effective than weight-bearing exercise on land for body fat reduction. Methods: To test these 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. Results: 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. Conclusions: 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.

Juan Carlos Colado et al.\textsuperscript{91} determined the effects of a supervised strength training program on body composition and physical capacity of older women using three different devices: weight machines, elastic bands, and aquatic devices that increase drag forces (ADIDF). Four groups were formed: control group, weight machine group (WMG), elastic band group (EBG) and a group that used ADIDF (ADIDFG). Body composition and physical capacity were assessed before and after the intervention period. The ADIDFG showed improvements in fat mass (FM), fat-free mass of the left arm (FFM-LA) and right arm (FFM-RA), knee push-up test (KPT), squat test (ST) and crunch test (CT) (p <0.05). Individuals in the EBG and WMG also improved their FM, fat free mass (FFM), FFM-LA, FFM-RA, KPU, ST and CT. ADIDF training improves body composition and physical capacity of postmenopausal women as does performing land-based training programs.

Eveline J. M. Wouters et al.\textsuperscript{92} has pointed out that the aim and method : To examine in obese people the potential effectiveness of a six-week, two times weekly aqua jogging program on body composition, fitness, health-related quality of life, and exercise beliefs. Fifteen otherwise healthy obese persons participated in a pilot study. Results: Total fat mass and waist circumference decreased 1.4 kg and 3.1 cm, respectively. The distance in the Six-Minute Walk Test increased 41 meters. Three scales of the Impact of Weight on Quality of Life-Lite questionnaire improved: physical function, self-esteem, and public distress.


Increased perceived exercise benefits and decreased embarrassment were observed. Conclusions: Aqua jogging was associated with reduced body fat and waist circumference and improved aerobic fitness and quality of life. These findings suggest the usefulness of conducting a randomized controlled trial with long-term outcome assessments.

Ryszard Jasinski et al. described the experiment that the Nordic walking and water aerobics are very popular forms of physical activity in the elderly population. The aim of the study was to evaluate the influence of regular health training on the venous blood flow in lower extremities and body composition in women over 50 years old. Twenty-four women of mean age 57.9 (± 3.43) years, randomly divided into three groups (Nordic walking, water aerobics, and non-training), participated in the study. The training lasted 8 weeks, with one-hour sessions twice a week. Dietary habits were not changed. Before and after training vein refilling time and the function of the venous pump of the lower extremities were measured by photo plethysmography. Body composition was determined by bioelectrical impedance. Eight weeks of Nordic walking training improved the venous blood flow in lower extremities and normalized body composition in the direction of reducing chronic venous disorder risk factors. The average values of the refilling time variable (p = 0.04, p = 0.02, respectively) decreased in both the right and the left leg. After training a statistically significant increase in the venous pump function index was found only in the right leg (p = 0.04). A significant increase in fat-free mass, body cell mass and total body water was observed (p = 0.01), whereas body mass, the body mass index, and body fat decreased (p < 0.03). With regard to water aerobic training, no similar changes in the functions of the venous system or body composition were observed.

Elizabeth F. Nagle determined the effects of the non-weight-bearing method of aquatic exercise as a modality for weight loss have not been established. The purpose of this study was to examine the effects of a combined aquatic-exercise and walking program compared with walking alone on body weight and selected variables in obese women undergoing a 16-week standard behavioural treatment program. Methods: Forty-four obese (body-mass index 34.9 ± 3.8 kg/m²) sedentary women age 40.3 ± 6.8 years were randomly assigned to one of two groups: aquatic and walking exercise (AE) or walking only (W). In addition, both groups were required to complete three sessions of home-based walking per week and were instructed to reduce energy intake to facilitate weight loss. Results: In the AE group, total body weight, cardiorespiratory fitness, flexibility, strength, and health-related quality of life significantly improved over time similarly to the W group. Slightly greater non-significant losses in body weight, improvements in flexibility, greater attendance rates, and significantly greater enjoyment scores also occurred in the AE group. Conclusion: These observations suggest that aquatic exercise in combination with walking can serve as an alternative to walking exercise alone for overweight women during periods of weight loss, and this can improve functional health status.

Maria Fragala-Pinkham made a comparison children with disabilities have lower physical activity levels and participate less in community-based sport and exercise programs than do children without disabilities. This in part is due to environmental barriers and lack of


appropriate resources in these programs. Adaptive programs encouraging increased physical activity for children with disabilities are needed, and as these programs are developed, they should be critically evaluated. Purpose: The purposes of this article are to describe a pilot aquatic exercise program for children with disabilities, to evaluate the program, and to determine areas of strength and areas needing modifications. Methods: A summative program evaluation design was used to assess this twice per week aquatic exercise program lasting 14 weeks. Sixteen children, ages 6-12 years, with developmental disabilities participated in the program. Children swam laps, participated in relay races and water basketball games, and performed arm and leg strengthening exercises using aquatic noodles, foam barbells, and water for resistance. Swimming skills, program evaluation questionnaires, physical activity questionnaires, and interviews of pool site directors were used to determine program outcomes. Results: Findings suggest that children made improvements in their swimming skills, parents were satisfied with the program, and children increased their physical activity levels during the program and maintained the increased physical activity levels six months after the program ended. The program continued in some form after the 14-week intervention ended. Conclusions: The program was successful in achieving its objectives and recommendations for application of this program are provided.

REVIEW OF RELATED LITERATURE OF SCHOOL BASED HEALTH AND FITNESS RELATED PROGRAM

Kristine reported the Alliance for a Healthier Generation’s Healthy Schools Program (HSP) is a national evidence-based obesity-prevention initiative aimed at providing the schools in greatest need with onsite training and technical assistance (TTA) and consultation with national experts (HSP national advisors) to create sustainable healthy change in schools’ nutrition and physical activity environments. The objective of this study was to evaluate the impact of HSP on the prevalence of overweight and obesity in California schools, from HSP’s inception in 2006 through 2012. Methods: We used state-wide body mass index (BMI) data collected annually from 5th-, 7th-, and 9th-grade students to determine whether enrolling in the HSP’s onsite intervention reduced the prevalence of overweight and obesity in intervention schools (n = 281) versus propensity-score matched control schools (n = 709) and whether increasing exposure to the program (TTA and contact with HSP national advisors) was associated with reductions in the prevalence of overweight and obesity. Results: Analyses showed no difference between HSP schools and control schools in overweight or obesity prevalence. However, program exposure varied widely among participating schools, and each additional contact with TTA or HSP national advisors was associated with a 0.3 Percentage decline in overweight and obesity prevalence (P<.05).Conclusion HSP appears to be an important means of supporting schools in reducing obesity. Although participation in HSP alone was not sufficient to improve weight status in California schools, there was a clear dose–response relationship to the program. HSP serves as an effective model for addressing childhood obesity among engaged schools

Miller examined the obesity and poor physical fitness is major health care concerns for children. These conditions are associated with future insulin resistance, type 2 diabetes mellitus, lipid abnormalities, and hypertension. The combination of increased caloric intake and decreased physical activity causes obesity in children. Addressing caloric intake and food selection alone may not resolve the underlying issues of insulin resistance and poor cardiac

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fitness. In adults, the leading predictor of cardiovascular and all-cause mortality is the level of physical fitness and not weight status. Because most adults do not perform moderate exercise 30 minutes per day on most days of the week as recommended, establishing healthy habits in children is important to reach this physical fitness goal. Various behavioural interventions in childhood have had mixed results. In a recent study, a school-based exercise program for adolescent girls resulted in an increase in physical activity and prevented the decline in cardiovascular fitness normally seen in this age group. Carrel and colleagues evaluated the effectiveness of a school-based fitness program on body composition, cardiovascular fitness level, and insulin sensitivity in overweight children. Children from one middle school whose body mass indexes (BMIs) were above the 95th percentile for their ages were invited to participate in the study. Before the intervention and at the end of the nine-month school year, data on height, weight, fasting blood glucose and insulin levels, body composition, and cardiovascular fitness were obtained by physical examination. After the baseline data were collected, the children were assigned randomly to the intervention or standard gym classes. Fifty-three students agreed to participate in the study, with 27 assigned to the intervention group. Students in the intervention group received a small nutrition education component that included information on healthy eating habits. The intervention group was divided into small classes (12 to 14 students) to allow for increased instructor attention, more opportunity for motivation, and less time standing in line. The curriculum was personalized to better match the students' skills. During the class, lifestyle-focused activities such as walking, cycling, and snowshoeing were emphasized. In the standard gym class, the children participated in more traditional sports. The main outcome measures were cardiovascular fitness, fasting insulin and glucose levels, and body composition. At baseline, the groups were similar with regard to age, BMI, percentage of body fat, lean body mass, and maximum oxygen consumption. The intervention group had a significantly greater loss of body fat (−4.1 percent) compared with the standard gym class group. They also had a significantly greater increase in cardiovascular fitness compared with the standard gym class. Fasting insulin levels decreased by 5.1 μIU per mL (35.4 pmol per L) in the intervention group, compared with an increase of 3.0 μIU per mL (20.8 pmol per L) in the control group. No one in the intervention group dropped out, whereas three students dropped out of the control group for reasons unrelated to the study. The authors conclude that a fitness-oriented, school-based intervention can have a positive effect on body composition, cardiovascular fitness, and fasting insulin levels in overweight children. The authors add that, as part of the public health approach to improving the health of overweight children, partnering with school districts is an important component of any intervention.

Aaron L. Carrel98 conducted research that the obesity and poor physical fitness constitute a health problem affecting an increasing number of children. Causes include a pervasive “toxic” environment that facilitates increased caloric intake and reduced physical activity. An effective strategy for prevention and treatment of childhood obesity likely includes a collaborative effort in the school setting. Objective: To determine whether a school-based fitness program can improve body composition, cardiovascular fitness level, and insulin sensitivity in overweight children. Design: Fifty overweight middle school children with a body mass index (BMI) above the 95th percentile for age were randomized to lifestyle-focused, fitness-oriented gym classes (treatment group) or standard gym classes (control group) for 9 months. Children underwent evaluation of fasting insulin and glucose levels, body composition by means of dual energy absorptiometry, and maximum oxygen consumption (V O2max) treadmill testing at baseline (before the school year) and at end of the school year. Settings: Rural middle school and an academic children’s hospital. Main Outcome Measures: Baseline test results for cardiovascular fitness, body composition, and fasting insulin and glucose levels. Results: At baseline, there were no differences between

groups before intervention (values for age, 12 ± 0.5 years [all results, mean ± SD]; BMI [calculated as weight in kilograms divided by the square of height in meters], 31.0 ± 3.7; percentage of body fat, 36.5% ± 4.6%; lean body mass, 41.4 ± 8.6 kg; and V O₂max, 31.5 ± 5.1 mL/kg per minute). Compared with the control group, the treatment group demonstrated a significantly greater loss of body fat (loss, −4.1% ± 3.4% vs −1.9% ± 2.3%; \( P = .04 \)), greater increase in cardiovascular fitness (V O₂max, 2.7 ± 2.6 vs 0.4 ± 3.3 mL/kg per minute; \( P < .001 \)), and greater improvement in fasting insulin level (insulin level, −5.1 ± 5.2 vs 3.0 ± 14.3 μU/mL [−35.4 ± 36.1 vs 20.8 ± 99.3 pmol/L]; \( P = .02 \)). Conclusions: Children enrolled in fitness-oriented gym classes showed greater loss of body fat, increase in cardiovascular fitness, and improvement in fasting insulin levels than control subjects. The modification to the school physical education curriculum demonstrates that small but consistent changes in the amount of physical activity has beneficial effects on body composition, fitness, and insulin levels in children. Partnering with school districts should be a part of a public health approach to improving the health of overweight children.

Lavelle\(^99\) examined childhood obesity predisposes to adult obesity and increases the risk of many diseases. Schools provide a vehicle to deliver public health interventions to all children. Methods: Medline and Embase were used to undertake a systematic review of published studies of school-based interventions aimed at reducing the body mass index (BMI) of children ≤ 18 years. Preferred reporting items for systematic reviews and meta-analyses guidelines were followed, and eligible studies subjected to a random effects meta-analysis. Results: Between 1991 and 2010, 43 published studies provided 60 measurements of effect. The pooled effect was a 0.17 (95% CI: 0.08, 0.26, \( P < 0.001 \)) reduction in BMI. Heterogeneity was high (\( I^2 = 93.4\% \)) but there was no significant small study bias (Egger's test, \( P = 0.422 \)) or significant variation by length of follow-up. The intervention comprised physical activity only in 11 (26%) studies, education only in three (7%), and combinations of these and improved nutrition in the remaining 29 (67%). On stratified analysis, physical activity used in isolation (−0.13, 95% CI: −0.22, −0.04, \( P = 0.001 \)) or combined with improved nutrition (−0.17, 95% CI: −0.29, −0.06, \( P < 0.001 \)) was associated with significant improvements in BMI. Interventions targeted at overweight/obese children reduced their BMI by 0.35 (95% CI: 0.06, 0.25, \( P = 0.002 \)). Conclusions: There is growing evidence that school-based interventions that contain a physical activity component may be effective in helping to reduce BMI in children.

William B. Strong\(^100\) has reviewed the effects of physical activity on health and behaviour outcomes and develops evidence-based recommendations for physical activity in youth. Study design: A systematic literature review identified 850 articles; additional papers were identified by the expert panelists. Articles in the identified outcome areas were reviewed, evaluated and summarized by an expert panelist. The strength of the evidence, conclusions, key issues, and gaps in the evidence were abstracted in a standardized format and presented and discussed by panelists and organizational representatives. Results: Most intervention studies used supervised programs of moderate to vigorous physical activity of 30 to 45 minutes duration 3 to 5 days per week. The panel believed that a greater amount of physical activity would be necessary to achieve similar beneficial effects on health and behavioural outcomes in ordinary daily circumstances (typically intermittent and unsupervised activity). Conclusion: School-age youth should participate daily in 60 minutes or more of moderate to vigorous physical activity that is developmentally appropriate, enjoyable, and involves a variety of activities.


Dianne Neumark-Sztainer has study tests the feasibility of an innovative school-based program for obesity prevention among adolescent girls. New Moves was implemented as a multi component, girls-only, high-school physical education class. Methods: Six schools were equally randomized into intervention and control conditions. Data were collected at baseline, post intervention, and 8-month follow-up to assess program impact on physical activity, eating patterns, self-perceptions, and body mass index (BMI) among 89 girls in the intervention and 112 girls in the control conditions. Program evaluation also included interviews with school staff, parent surveys, and participant interviews and process evaluation surveys. Results: The feasibility of implementing New Moves was high, as indicated by strong satisfaction among participants, parents, and school staff, and by program sustainability. Participants perceived a positive program impact on their physical activity, eating patterns, and self-image. Girls in the intervention significantly progressed in their stage of behavioural change for physical activity from baseline to follow-up. However, for the majority of outcome variables, differences between intervention and control schools at post intervention and follow-up were not statistically significant. Conclusions: New Moves was well received and fills a needed niche within school physical education programs. An expanded intervention and evaluation is needed to enhance and assess long-term program effectiveness.