Chapter II

REVIEW OF RELATED LITERATURE

The research scholar’s effort to locate literature to the problem was mainly confined to the Library of Lakshmibai National Institute of Physical Education, Gwalior, (India) which is considered to be the best library in India, as far as literature on physical education and sports is concerned. Some data were collected through electronic media like internet and reference encyclopaedia.

Self\(^1\) conducted investigation of the effects of a 10-week physical training (aerobics) and nutrition education/counselling program on body fat of 443 children attending Tarrant Elementary School. The students participated in regular physical education classes or aerobics classes. In the beginning of the program those subjects found obese, were given nutrition education/counselling by either handouts or lecture of their parents. Skin fold measurement were taken prior to and following a treatment period of 10 weeks. ANOVA was used to determine: 17 differences made in body fat between treatment and regular groups and 27 differences in body fat

between obese children receiving handouts or lectures and non-obese children receiving no nutrition education/counselling.

Results were that statistically significant differences were found between body fat of aerobic and regular physical education groups (P < .05). The aerobics group demonstrated significantly greater decreases in skin fold fat than the regular physical education group. No statistically significant differences in body fat were found between the three nutrition education/counselling groups.

It was concluded that the aerobics program was more effective than the regular physical education program for fat reduction. Neither nutrition education/counselling strategies were shown to be effective in reducing body fatness.

Cooper² conducted the effect of obesity on skill attainment in twelve year old children as measured by performance on three novel manipulative skills. The study was to determine if obesity was a significant, negative factor in the ability of children to learn manipulative, non locomotors skills, three novel manipulative skills were chosen for this study: jogging, flip sticks, and the Chinese yo-yo. A group of 48 in which 26 boys 22 girls, served as subjects for

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this study obese and non obese. Criteria for inclusion in the obese group were: a percentile rank of twenty or less on the AAHPERD-HRFT percentile norms skin fold chart, and a chronological age between eleven years, eleven months and twelve years. Criteria for non obese were: a percentile rank of 80 or greater on the AAHPERD-HRFT Percentile norms skin fold chart and a chronological age of between eleven years, eleven months and twelve years and eleven month.

The study consisted of teaching the subjects the three skills over a six weeks period. The subjects were allowed 15 minutes each day per skill to practice and ultimately perform each of the skills. The subjects were timed to the nearest minute of accumulated time once they satisfactorily demonstrated the skill. The two groups were compared to each other on the amount of time to learn the three skills. T-test was used to test the groups statistically for significance between the group means, at the .05 level of significance.

Statistical treatment of the data indicated that obesity was not a significant negative factor in the amount of time required to learn the three novel skills. It should be noted that in some instances the obese subjects had a lower group composite time than their non-
obese counterparts. The obese group of subjects and the obese girls sub group had lower times on the Chinese yo-yo skill.

Reid\textsuperscript{3} conducted this study on culture of overweight children social interaction and physical activity patterns of overweight children. The purpose of this multi-case study was to provide insight into the social interaction and physical activity patterns of overweight and non-overweight children. Qualitative research methods were utilized to determine the perspectives of four children (two overweight and two non-overweight) and their parents with regard to their social interaction and physical activity patterns. The research scholar conducted interviews, made participant observations in different settings and analyzed personal documents of participants. The research scholar conducted on-going interviewing. Two types of interviewing were employed. One type of interviewing was periodic, in depth, semi-conductive interviews in the form of "guided conversations". Another source of qualitative data collection was participant observation. Observation occurs in many difference schools setting. Some of these setting included: classroom, physical education, lunchroom, and recess. These

observations take place over the period of 6 weeks. The research scholar observed a minimum of three days per week and visited the subject’s different time of school day. A third source of qualitative data was the assembling of personal documents from the participants. These documents came in the form of assignments, stories, drawing and worksheets. Inductive analysis and the constant comparative method were used to analyze the data. Several themes or continuing issues emerged from the in-depth interviews, informal observation issues emerged from participants in different settings, and personal documents created by these four children. These themes included information on children’s perceptions of overweight children, the physical activity and nutritional patterns of children, the attitudes towards physical education and physical activity, and the social interaction patterns of overweight and non-overweight children, emerging themes were further explored in follow-up interview conducted at the end of the observational period.

East\textsuperscript{4} conducted a study on body fatness and motor performance during pre-adolescence. The purpose of this study was to investigate the relationship between selected physical

performance tests and body fat in preadolescent boys and girls. Measures of age, height, weight, skin fold thicknesses at two sites, and performance scores on the vertical jump, standing broad jump, modified pull ups, 40 yards dash, and 400 yards run were obtained on 563 elementary school children. The results of one way ANOVA indicated that there was a significant difference between boys and girls on all of the physical performance tests. Although the boys were slightly taller and heavier and scored better than the girls on the performance test, there was no significant difference between the sexes in the sum of skin folds. Separate regression equation for the sum of two skin folds by performance on each test indicated that with the exception of modified pull up test, body fatness was only marginally related to performance. These findings indicated that although inversely related to the ability to remove the total body weight, body fatness was of minimal importance in explaining performance differences between young boys and girls.

Crespo\textsuperscript{5} conducted this study on U.S. boys and girls to examine the relationship between television watching, energy intake, physical activity and obesity status, aged 8 to 16 years. He used a

nationally representative cross-sectional survey with personal interview and a medical examination, which included measurement of height and weight, daily hours of televisions watching, weekly participation in physical activity, and a dietary interview. Between 1988 and 1994 the third national health and nutrition examination survey collected data on 4,069 children. The prevalence of obesity was lowest among children watching four or more hours of television a day. Girls engaged in less physical activity and consumed fewer joules (a unit of energy) per day than boys. A higher percentage of non Hispanic white boys reported participating in physical activity five or more times per week than any other race/ethnic and sex group. Television watching was positively associated with obesity among girls, even after controlling for age, race/ethnicity family income, and weekly physical activity and energy intake. It concluded that as the prevalence of over weight increases, the need to reduce sedentary behaviours and promote a more active lifestyle become essential.

Ladda et al. (1998) evaluated that exercise has been found to be effective for prevention of weight gain and maintenance of a

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stable weight in adults. The objective of this study was to evaluate the effect of a school based aerobic exercise program on the obesity indexes of pre-school children. Subjects were 292 second year elementary school pupils from kindergarten in Hat Yai municipality, sinkhole province, southern Thailand. A specially designed exercise program, included a 15-mins walk before beginning the morning class and 20-mins aerobic dance session after the afternoon gap, 3 times a week, was conducted for 6 weeks. Weight, height, and triceps skin fold thickness were measured 4 times. At the end of the study, the prevalence of obesity, using 95th percentile national centre of health statistics triceps skin fold thickness cut offs, of both the exercise and control group decreased of the exercise group decreased from 12.2% at baseline to 8.8% (Wilcoxon on signed rank test \( p=0.058 \)). Whereas that of the control group decreased from 11.7% to 9.7% (Wilcoxon on signed-rank test = 0.179). A sex difference in the response of body mass index (BMI) to exercise was observed. Girls in the exercise group have a lower likelihood of having an increasing BMI slope than the control girls did. In conclusion, the study suggested that a 6-week school based exercise program could prevent BMI gain in girls and may induce a remission of obesity in preschool age children.
Fisher\(^7\) (1986) investigated a self-concept construct in overweight and non-overweight elementary school age children. Self-concept was defined as attitudes toward the self and others. Overweight was defined as weight above the 75th percentile by height and age on the national centre for health statistics growth curve charts. The experiment comprised of seven variables (body esteem, attitudes towards others, autonomy, physical appearance, interpersonal adequacy, academic adequacy, and teacher school relations) derived from scores on the body esteem scale, the how I see myself scale, and the paired hands test. The hypothesis was tested by one-way multivariate analysis of variance procedure. The sample was comprised of 70 Caucasian elementary school children from a school district in north-eastern Oklahoma. The age range of the sample was 8-11 years. Data were gathered by means of group test administrations. A significant difference was found on 0.05 level of confidence. Based on the findings, inference was made that self concept was affected by overweight. However, examination of the variables by unvaried analysis revealed that the strongest support for

the construct was found for body esteem. No differences were found for the other variables.

Hall\(^8\) (1993) investigated the effect of a token reinforcement intervention (a physical activity program) on the percent of leisure time subjects spent in physical activity, degree of overweight, self-concept and attitude towards physical activity. Also addressed was the suitability of the intervention for overweight control for adolescents. A single subject A-B-A design was used to evaluate the relationship between the independent and dependent variables. Changes in degree of overweight were measured using body weight, body mass index (BMI), and waist-to-hip ratio techniques. Self-concept and attitude towards physical activity were measured using a pre-test / post-test questionnaire. Suitability of the physical activity program was evaluated with a staff questionnaire. All subjects experience an increase in physical activity and a decrease in waist-to-hip ratio as a result of the intervention. With the exception of one subject, BMI declined. Improvements in self-concept scores occurred for three subjects, while two subjects showed an improved attitude towards physical activity.

Sardinha, et al. (1999) investigated valid and practical methods based on health related criteria for obesity screening in children and adolescents. Researcher assessed the usefulness of BMI, triceps skin fold thickness, and upper arm girth for screening for obesity by using a health-related definition of obesity (>25% body fat in boys and >30% body fat in girls) and a criterion method (dual-energy x-ray absorptiometry) that estimates percentage fat without the potential bias associated with other methods in adolescents. This was a cross-sectional study of Portuguese boys (n=165) and girls (n=163) aged 10-15 year. Nonparametric receiver operating characteristic (ROC) analysis was used to define the best trade off between true-positive and false positive rates. True-positive rates ranged from 67% to 87% and from 50 % to 100% in girls and boys, respectively, and false positive rates ranged from 0% to 19% and from 5 % to 26 %, respectively. For children aged 10–11 year, the areas under the curves (AUCs) for ROCs, an index of diagnostic accuracy, were close to 1.0, suggesting very good accuracy. For older boys and girls, AUCs for triceps skin fold thickness were similar to or greater than AUCs for BMI and upper

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rm girth. The results suggest that triceps skin fold thickness gives the best results for obesity screening in adolescents aged 10-15 year. BMI and upper arm girth were reasonable alternatives, except in 14-15 year old boys, in whom both indexes were only marginally able to discriminate obesity.

Turpentine\textsuperscript{10} (1981) investigated the relationship between obesity and self-concept in pre-adolescents and adolescents. There was also an examination of the relationship that these two variables had with academic achievement. Data was collected from 85\textsuperscript{th} sixth graders and 168 ninth graders on socio economic status, race, sex, and body mass, self-concept and academic achievement. The anthropometrics indices of body mass (quettelet index, triceps skin fold, biceps skin fold and arm circumference) were significantly correlated with the teacher ratings of body mass. These high correlations validated the use of teacher ratings of body mass as a method for classifying the subjects into categories of below normal body mass, normal body mass, and greater than normal body mass. The status of the self-concept was determined by scores from multidimensional NTS self-observation scales (SOS). The academic

\textsuperscript{10} Turpentine, Sheila Hill, "The Relationship between Body Mass and Self Conception Pre-adolescents and Adolescents." \textit{Dissertation Abstracts International} (1981) 06:2313-B.
achievement was assessed according to the results of the California achievement test (CAT). The pre-adolescents demonstrated significant negative correlation between greater than normal body mass and self-concept dimensions of self-acceptance, self-security, social maturity, social confidence and peer affiliation. The obese pre-adolescents had significant lower scores in these dimension than their non-overweight classmates. For the adolescent sample, the body mass influenced significant differences in the self-concept mean scores for school affiliation and social confidence. The mean scores for school affiliation and social confidence were significantly lower for obese adolescents than those of the non-overweight adolescents. Research results showed significant positive correlation between self-concept and academic achievement for both pre-adolescents and adolescents. A significant negative correlation existed between the pre-adolescent levels of body mass and the CAT scores for spelling, mathematics, and total battery. The adolescent levels of body mass significantly and negatively correlated with all of the CAT scores. Those subjects with greater than normal body mass demonstrated poorer academic achievement. The finding of this study provides evidence that preadolescent and adolescent
obesity correlated strongly with poor self-concept and low academic achievement.

Ball\textsuperscript{11} et al (2001) provided the detail of the recent worldwide increase in the prevalence of childhood obesity might be due to a decrease in children’s physical activity levels. The current study of children in the years just before puberty aimed to (1) measure total energy expenditure (TEE) by use of the doubly labelled water (DLW) method, (2) determine the proportion of TEE related to physical activity, (3) investigate the relations between measures of physical activity and body fatness, and (4) investigate possible sex differences in these relations. The DLW technique was used to measure TEE over 10 days in 106 healthy children (52 boys) aged 7.8 ± 0.9 year (x ± sd) fat free mass, and hence fat mass, was derived from the 180 dilution space. Resting energy expenditure (REE) was calculated with use of the Sheffield equations. Physical activity level was calculated as TEE/REE. Mean TEE in both boys (7871 ± 1135 kg/d) and girls (7512 ± 1195 kg/d) was significantly different (p<0.0001) from FAO/WHO/UNO recommendation (13% and 9% lower, respectively). There was no significant difference in physical

activity level between boys (1.69 ± 0.22) and girls (1.71±0.23). In boys but not girls, physical activity level was inversely correlated with BMI (r=0.37, p, 0.01), fat mass (r=0.46, p, 0.005), and percentage of body fat (r=0.50, p, 0.0001). In boys but not girls, percentage of body fat was inversely associated with physical activity level. Physical activity was one factor contributing to body fatness in boys, but additional factors may influence the size of the fat stores in girls.

McMillan and Erdmann\(^{12}\) (2001) described gender-specific health-related physical fitness measurements in kindergartners and determine relationships between body fatness and health-related physical fitness test performance. Children participants were 1,585 kindergartners (792 boys, 793 girls) from a rural mid western public school district. The sum of triceps and medial calf skin folds (SSK) was used to estimate percentage of body fat (BF %). Body mass index (BMI) was calculated for height and weight measures (wt/hi\(^2\)). Cardio respiratory fitness was assessed via a 1-mile run/walk test. A sit-and reach test was used to measure flexibility. Muscular strength/endurance was assessed from pull-up and 1 minute bent-

knee sit-up tests. Pearson correlations were used in the analysis with
the alpha level set at .01. Significant positive relationships were
found between SSK and 1-mile walk/run times for both boys (r = .27) and girls (r = .22). Significant inverse relationships were found
between SSK and pull-ups for the both boys (r = .27) and girls (r = .25) as well as SSK and 1 minute bent knee sit-ups for both boys (r = .12) and girls (r = .15). Neither boys nor girls showed a significant
relationship between SSK and sit- and reach. Correlations between
BMI and SSK were found .68 and .72 for boys and girls respectively. Excluding the sit- and reach test, researcher found
higher body fatness to be significantly associated with poorer health-
related physical fitness test performance in both kindergarten boys
and girls.

Hoerr 13(1985) examined the bleak outlook for obese children
who do not attain normal weight by the end of adolescence and high
incidence of obesity in children make adolescent obesity a major
public health problem. The prevalence of obesity in the population
of 12 and 13 years old was 19% or greater as determined by a health
screening of 400 junior high school students on two successive

Dissertation Abstracts International (1985) 4:22-B
years. Intervention was indicated from the high prevalence of obesity and a study was designed (1) to develop, implement and evaluate an intervention program for obese adolescent girls, (2) to discriminate completes from dropouts, and (3) to identify contributors to changes in health parameters. A pilot study and two treatment replications were conducted for twenty-six 12-15 year-old obese girls, passed menarche. A weight winner, a multi-component and multidisciplinary intervention program, was developed. Evaluation results of 12 completers from before, after and at a 7-9 month follow-up indicated that the treatment program was successful in (1) reducing rate of gain and decreasing ideal body weight by 11% while maintaining lean tissue and basal metabolic rate, (2) improving cardiovascular fitness, self-esteem and self-control, and (3) improving eating and exercise behaviours. Program completers were discriminated from non-completers by having better educated parents, being older, having lower resting heart rates and having a sibling overweight. Implementing a fee contingent on attendance and on record keeping greatly reduced attrition. Subjects cited the weight winners program, aerobic exercise, changes in eating behaviours, group and family support, and encouragement and praise from the group leader as important contributors to success in weight control.
Barriers to change were reported by participants as problem, hunger, lack of family and peer group support and having food in sight. The treatment of adolescent obesity is complex, but one which can be successful if given appropriate treatment goals, motivated adolescents, a good multidisciplinary and multi component intervention program, a conducive setting, parental support, and enthusiastic and understanding instructors.

Carlosmonteiro and popkin\textsuperscript{14} (2002) examined the trends of overweight and underweight in young persons aged 6-18 years from two countries. Nationally representative data from Brazil (1975 and 1997), Russia (1992 and 1998), and the United States (1971-1974 and 1988-1994) and nationwide survey data from china (1991 and 1997) were used. To define overweight, the sex- and age- specific body mass index cut offs recommended the international obesity task force was used. The sex- and age- specific body mass index fifth percentile from the first US national health and nutrition examination survey was used to define underweight. The prevalence of overweight increased during the study periods in Brazil (from 4.1 to 13.9), China (from 6.4 to 7.7), and united sates (from 15.4 to

25.6); underweight decreased in Brazil (from 5.1 to 3.3). In Russia, overweight decreased (from 15.6 to 9.0] and underweight increased (from 6.9 to 8.1). The annual rates of increase in the prevalence of overweight were 0.5% (Brazil), 0.2% (china), -1.1% (Russia), and the (united states). The burden of nutritional problem is shifting from energy imbalance deficiency to excess among older children and adolescents in Brazil and China. The variations across countries may relate to changes and differences in key environmental factors.

Gutin, et al. 15(1996) examined that the effects of supervised physical training (PT) and life style education (LSE) on risk factors for coronary artery diseases and non - insulin- dependent diabetes mellitus were compared in obese 7 to 11 years old black girls. The subjects were divided into two groups. The PT group (N=12) completed 5 days in a week, and aerobic training program also; and the LSE group participated in weekly lifestyle discussions to improve exercise and eating habits. The PT group showed a significant increase in aerobic fitness (p<0.05), while the LSE group declined significantly more in dietary energy and percent of energy from fat (P<0.05). Fasting insulin did not change significantly. The

LSE group declined significantly more than the PT group in glucose (P<0.05), and glycohemoglobin declined from baseline in both groups (P<0.05). Lipid changes were similar in the two groups: total cholesterol/high density lipoprotein cholesterol (P<0.01) and triglycerides (P<0.05) declined, the low density lipoprotein (LDL) apprises in B ratio increased (which indicates a decrease in small dense LDL)(P<0.05) and lipoprotein (a) increased (p<0.05). The interventions were similarly effective in improving some diabetogenic and atherogenic factors, perhaps through different pathways; I e, the PT improving fitness and fatness, while the LSE improved diet.

Cureton, et al\textsuperscript{16} (1975) studied the relationship between body composition measures and AAHPER fitness test performance. Relationship between total body density, total body potassium, skin fold thickness measurements and AAHPER youth fitness test performance were determined on 49 boys of 8 to 11 years of age. Zero order correlation between body composition measures and performance scores were low or moderate. In general body density, body potassium and skin fold thickness predicted performance

equally well with age. Analysis of relationship between AAHPER test items and the physical development variables demonstrated that there was a large proportion of common variance between the two sets of variables and significant relationships existed along two independent dimensions. It was concluded that not only variations in body size but also variation in body composition should be considered, when interpreting results of the AAHPER test for individual children and for comparison of groups of children who differ in body composition.

Cureton. Et al.17 (1977) investigated the relative importance of body size, body composition, cardio-vascular capacity and running speed in determining individual differences in performance on 600 yards run and 1 mile run test, using data on 196 children, aged 7 to 12 years. A multivariate, multistage path model was developed in which height, percent fat, vo2 max and 50 yards dash time was postulated as determinates of individual differences on the two distance running tests. These four independent variables accounted for 71% to 66% of the variance in 600 yards run and 1 mile run respectively. All four independent variables had significant

17 Cureton, Kirk J, et al, "Determinants of Distance Running Performance in Children."
associations with two distance runs. When the influence of other independent variable was taken into account, the 50 yards dash time and percent fat were found to be most important determinates of both distance runs.

Nguyen\textsuperscript{18} (1996) examined the relations between obesity in parents and fat intake in their children, and the effect of fat intake on fat mass in these children. Heterogeneous sample (x± SD; 20.2= m3.4 kg; 3.2=1.3kg fat mass) consisted of 56 white and 15 Mohawk children 4-7 years of age (35 girls and 36 boys) taken. Dietary intake was assessed with the Willett food frequency questionnaire revised for children. Body composition was measured by bioelectrical resistance and sub- scapula and triceps skin fold thicknesses. Physical activity energy expenditure was estimated by the difference between total energy expenditure (measured over 14 days by the doubly labelled water method) and post-prandial resting energy expenditure (measured by indirect calorimetric). Before statistical analysis, at mass was adjusted for fat free mass and fat intake was adjusted for fat free mass, and fat intake was adjusted for non-fat intake. There was no effect of sex or ethnicity on fat intake,

and no effect ethnicity on relation between fat intake and fat mass. Adjusted mean (=SE) fat intakes for the groups of children, based on parental obesity status, were as follows; 2.65 = 0.09 MJ/d (no obese mother and father), 2.85 = 0.12 MJ/d (obese Mother, non obese Father), 2.58=0.10 MJ/d (obese father, no obese mother) and 2.79=0.10MJ/d (obese Mother and father). He found an influence of maternal obesity on dietary fat intake in children (p<0.01) but not in girls after adjustment for physical activity energy expenditure. Data suggested that (1) mothers may contribute to the development of obesity in children by influencing their dietary fat intake, and (2) dietary fat intake contributes to obesity in boys independent of physical -activity energy expenditure.

Barfield, et al.19 the purpose of this study was to document the intra-individual changes (i.e., tracking) of FITNESSGRAM criterion referenced scores among children in grades 3 through 6 across a school year. Children (N=390) from two local elementary schools, participating in physical education class twice a day. They were tested on the following FINNESSGRAM items: a) the 1-mile run/walk, b) the modified pull-up, (c) the curl-up, (d) the back saver

sit-and-reach, (e) the trunk life, and (f) the body mass index. Statistics were calculated between fall and spring criterion classifications (health-unhealthy) on each test item. Percentage of agreement indexes for the entire sample were high among the 1 mile run, the sit-and-reach, and the body mass index, ranging from 86-88%. In the current study, consistency of classification on the body mass index was higher among older girls than younger (pa increased from 68% in grade 3 to 94% in grade 6). Although gender differences were noted in grades 3 and 4 on strength and aerobic was not associated with consistency of classification on other test items across grade levels. Regarding children moving from an unhealthy to healthy status on the 1 mile-run (9%), body mass index (4%-9%), and modified pull-up (6%-7%), however, a larger percentage of boys and girls were able to improve health status on the curl-up (13%-19%). An equal amount of children moved from health to unhealthy classifications on the 1 mile run (8%-4%), body mass index (8%-9%) modified pull-up (16%-12%) and the curl-up (13%-12%).

Wadden, et al.\textsuperscript{20} (1984) compared the study of self concept for 716 white children in grades 3-8, who were classified as obese or

normal weight after their ideal weight was calculated accounting for age, sex and height. Fat percentage 20% or more over ideal weight were characterized as obese. No significant differences were found in self-concept in the two groups.

Kim 21(1986) investigated the relationship between the Korean Youth Fitness Test (KYFT) and the AAHPERD health related Physical Fitness Test. Three hundred Korean male student's grades 7th to 11th were selected as subjects. The subjects completed experimental test items and the data were analyzed by three different statistical methods: simple, multiple, and canonical correlation. The middle school students were less homogeneous in their performance than the high school students and the correlations between the KYFT and the AAHPERD were higher for the middle school students than for the high school students. Most of the experimental test items were moderately Inter-correlated, especially in the data for the middle schools students. There was a significant relationship between the KYFT and the AAHPERD for the middle and the high school students.

21 Kim "Relationship between the Korean Youth Fitness Test and the AAHPERD Health Related Physical Fitness Test for Male Korean Middle and High School Students" Dissertation Abstracts International (1986) 10:2961-A.
Lloyd\textsuperscript{22} conducted a study on effect of caloric restriction and resistive exercise on the resting energy expenditure of weight-reduced obese girls. The purpose of this study was to investigate the effect of a six week regimen of low caloric restriction and resistive exercises on the body composition and resting energy expenditure of obese girls. Twenty four subjects were randomly assigned to one of the four groups: control diet, exercise, and diet plus exercise. After three weeks, and after six weeks of intervention, body composition and resting energy expenditure were measured by body density and oxygen consumption, respectively; differences between groups for the dependent variables were analyzed by analysis of variance. The level of correlation was set at $P<0.05$. Body mass increased significantly for the diet group (-4.0kg) and the diet plus exercise group (-4.9kg) compared with control group (-0.2kg) and the exercise group (24) percent body fat decreased significantly for the diet group (2.7%) and for the diet plus exercise group (4.0%) compared with control group (-0.5%) and exercise group (0.6%) lean body mass increases for the exercise group (1.0 kg) and the control group (-0.3kg) compared with the diet group (-0.2kg) and

\textsuperscript{22} Stop, Jane Lloyd. "Effect of Caloric Restriction and Resistive Exercise on The Resting Energy Expenditure of Weight Reduced Obese girls." Dissertation Abstracts International 52:5 (Nov.1992); 1447-A
the diet plus exercise group (-0.3kg). Resting energy expenditure significantly decreased in the diet group (-193kcal/day) compared to the diet plus exercise group (-52kcal/day), the control group (-8kcal/day), and the exercise group (6kcal/day). Significant increases in strength were found in both the exercises group.

There was no advantage to adding resistive exercise to a low caloric diet for either body mass loss or body composition changes. Adding resistive exercise to a low caloric diet prevented the decrease in resting energy expenditure associated with calorie restriction. A low caloric diet did not affect the strengthening response of muscle to resistive exercise.

Dwyer\textsuperscript{23}et al (1998) determined whether overweight or over fatness were predicted from sex, race or ethnicity, school site, and intervention or control status for children who were 9 years old at the outset of the child and adolescent trial for cardiovascular health (CATCH). In this ethnically and geographically diverse group of 5106 students, height, weight, and triceps skin fold thickness were measurement at 9(base line) and 11years (follow up) of age. The strongest predictors of status at follow-up were baseline overweight

(odds ratio: 69.0; 95% c1: 54.9, 96.3) and over fatness (odds ratio: 27.4; 955 c1: 22.4, 33.4); site, African American race of ethnicity, and male sex were also significant independent associations. Children in the overweight (>85th percentile for body mass index) group had significantly higher adjusted means for total blood cholesterol, higher protein-B concentration, lower mean HDL-cholesterol concentrations, and lower performance on the 9-min run than those in other groups (<15th, 15-49th, or 50-85th body mass index percentile). Similar results were found for these factors for those subjects with greater triceps thickness measurements. Groups of children who were overweight and over fat at baseline were more likely to be overweight and over fat at follow up and to have more cardiovascular risk factors than their peers.

Delay24 (1998) explained the role energy expenditure plays in dietic obesity was somewhat confused by early research purporting to show that, as a group, obese children have lower energy intake than do lean children. On the basis of this intake data, the conclusion was drawn that obese persons are somewhat energy efficient, leading to weight gain. More recent research examining energy expenditure

has shown clearly that as a group, obese children have higher energy expenditures that do their lean counterparts. With the advent of the doubly labelled water method for determining free living energy expenditure, it has been shown that obese children under report intake significantly more than do lean children. When measurements are properly adjusted for differences in body size, there are generally major differences in energy expenditure between lean and obese groups. However, in some cross-sectional studies, a low level of physical activity has been shown related to current body fatness. In addition, longitudinal studies have shown that a low level of energy expenditure, particularly energy in physical activity is associated with both fatness and weight gain.

Pizarro (1982) investigated the use of the Health Related Physical Fitness test and the Modified Pull-up with mainstreamed EMP/TMR children. Comparison of health related fitness levels and modified pull-up scores of mainstreamed EMR/TMR children to normal children was a secondary aspect of the study. Subjects of the study were 129 twelve to fifteen year old male and female, normal, EMR and TMR children from mainstreamed settings. Following

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orientation to test procedures, the subjects were administered the following items: (a) Modified sit-ups, sit and reach, skin fold fat measurement and Modified sit-ups, were found to be reliable and suitable for use with mainstreamed EMR/TMR children. The 880 yard run was inappropriate for TMR'S and acceptable for EMR'S, provided adequate preparation was given beforehand. Proper orientation, an allowance for practice and the development of an appropriate test environment appeared to be particularly aspects of test preparation for children functioning at a less than normal intellectual level. A two-way analysis of variance was performed to compare among the samples (Normal, EMR, TMR) and between sexes (Male, Female). Mainstreamed EMR/TMR children were found to have lower health related fitness levels than normal children. Significant differences between normal and mentally handicapped were noted for the modified sit-ups, sit and reach, 880 yard run, and Modified Pull-ups. Non- significant differences between normal and EMR/TMR adolescent were found in the assessment of body fat Comparison between sexes indicated that fitness founds in retarded populations are similar to normal populations. Males demonstrated significantly more strength and endurance, and better cardio respiratory endurance than females.
Females were significantly more flexible than males and tended to have greater amounts of body fat.

Reed H\textsuperscript{26} conducted this study to check the effect of diet and cycle exercise on body composition and metabolic measures in obese children. The effect of cycle exercise and dietary caloric restriction on resting metabolic rate, body composition, and cardiovascular fitness were examined in young obese males. Twenty males' volunteers were placed on 1000 kcal in their daily dietary intake. One half of the subjects were randomly assigned to a diet plus exercise treatment group the other half to a diet only treatment that included the program of stretching exercises equal in time to the exercise component of the D+E group. The ten week treatment program meet makes five days / week. Weekly meeting on an individual bases were held with a registered dietician. All measures of body composition decreased significantly for both the D+E and D groups over the ten-week treatment period. No significant differences existed between the D+E and D groups for any measure of body composition. Fitness improved significantly in the D+E group.

\textsuperscript{26} Humphrey, Reed H. PH.D, "Effect of Diet and Cycle Exercise on Body Composition and Metabolic Measures in Obese Children." Dissertation Abstracts International Vol. 47 No (10. April 1987) Page No. 3695- A
It was concluded that at a level of moderate caloric restriction, significant reductions in total body weight, body fat, and body weight, body fat, and LBM may be expected, and additional weight loss associated with aerobic exercise can be reasonably predicated. Further, cardiovascular fitness improves in a D+E treatment when compared to sedentary individuals undergoing similar dietary caloric restriction. Finally the expected reduction in RMR normally associated with dietary caloric restriction and a decreased <BM was not evident at a moderate level of restriction.

Obara⁷⁷ (1997) compared health-related physical fitness of high school students in two schools that have different physical education programs. Argyle academy has physical education 6 classes out of 7 days. Students in the seventh, eighth, and tenth grade from physical education classes were selected for testing in each school. Data from 102 students from argyle academy and 96 students from riverside park academy were collected during an eight-week period. Health-related physical fitness was assessed using the following test battery: sum of five skin folds, waist to hip ratio, 20m shuttle run, curl-ups, 90 degree push-ups, back saver sit and reach,

and trunk lift. School group, gender, and grade comparisons were using a ANCOVA procedure. The students from Argyle Academy demonstrated significantly better scores for the 20 meters shuttle run and trunk lift. While those from Riverside Park Academy demonstrated significantly better scores for the curl-ups and 90 degree push-ups. There was no significant difference in the sum of five skin folds, waist to hip ratio, and back saver sit and reach.

Lee²⁸ (1995) examined the degree of body fatness and the developmental trends of body composition of Korean youth. The Korean data were compared with U.S. reference data from the national children and youth fitness study. The goal of this study was to compare the body composition of Korean and American youth and to establish body fat standards of Korean youth. The subjects were 1,663 Korean students from grades 7 to 12. The anthropometric measurements included weight, height, triceps and medial calf skin folds. A polynomial trend analysis examined the development trends of body composition of Korean youth. Girls had significantly more subcutaneous adipose tissue than boys. A significant age by gender interaction existed, showing that skin fold profiles for males and

females were no parallel over the age groups. The gender specific polynomial trend analysis defined the skin fold trend over ages. Generally, girl’s body fatness increased, while body fatness decreased throughout the teen years for the sum of triceps and calf skin fold thickness, girl’s increases with a cubic trend, whereas boys maintained a constant trend. For the medial calf skin fold, girls increased with a cubic trend, while boys decreased with a linear trend. Triceps skin folds for the girls continually increased with a quadratic trend, while boys decreased until age 17 and then increased up to age 18 with a quadratic trend. When compared to American youth, Korean youth, boys and girls, were shorter and lighter. In contrast, the triceps skin fold of Korean boys and girls was thicker than American youth. Moreover, the skin fold and body mass index profiles of Korean and American youth followed similar patterns. To determine the degree of body fatness of Korean youth, the prevalence of obesity and overweight was estimated and compared with American youth. The prevalence of overweight in Korean youth, boys of girls was lower than American youth, but the prevalence of obesity in Korean boys was higher than U.S boys. In contrast, the prevalence of obesity in Korean girls was lower than U.S girls. For educational and health promotional purposes, both
norm-referenced and criterion-referenced body fat standards of Korean youth were developed.

Newton 29(1989) investigated known related factors involved in the predisposition of an individual to choose to participate in positive exercise behaviour to determine if there were linear relationships between those factors and actual scores achieved by women on the AAHPERD health related physical fitness test. The subjects were 56 volunteer women students from the population of students attending selected colleges in Washington, D.C., Maryland, and North Carolina. The AAHPERD health related physical fitness test and a questionnaire on background history were administered to all subjects. It was concluded that female college undergraduates who participate in high school varsity team activities would be more likely to have lower body fat composition and score more positively on cardiovascular endurance measures than non-participants; that female college undergraduates who participate in intramural activities would be more likely to have greater flexibility than non-participants; that female college undergraduate who received family member encouragement for activity participation would be more

likely to have greater flexibility than those not receiving that encouragement. The possibility for greater cardiovascular endurance of physical fitness were more likely to have greater abdominal strength / endurance, lower body fat composition, and greater negatively perceived experience in high school physical education instruction seems to have no effect on fitness performance score; and that the combination of high school varsity activity participation, family members encouragement of activity, high school intramural participation, and belief in the value of physical fitness were important factors for females in their level of and /or intensity of activity participation.

Leroy\textsuperscript{30} conducted this study; two experiments were completed to determine the effects of exercise on lean body weight during periods of calorically induced weight loss. In the first experiment 10 subjects (6 women, 4 men) were randomly divided into diet only and diet plus exercise groups. Caloric intake for dietary subjects in the both studied were reduced to 3 days/week of aerobic exercise and 3 days / week of weight training. Body weight decreased significantly (p<0.05) for the diet only (-4.80kg) and diet

\textsuperscript{30} Ball or, Dongles Leroy, PH.D, "Weight Loss and Lean Body Weight Maintenance." Dissertation Abstracts International vol 47, 10 (10 April 1987) P: 3693-A.
plus exercise (-6.0kg). LBW decreased significantly for the diet plus exercise group (-1.60kg) with non-significant decrease (-0.20kg) for the diet only group. In the second experiment, 40 obese women went an 8-week diet and exercise program subjects were divided into control group, diet only, diet plus exercise and only exercise groups. Weight training exercise was used exclusively in this experiment 3 days/week. Body weight decreased for diet only (-4.47kg) and diet plus exercise (-3.89kg) compared to C (-0.38kg) and exercise only [0.45kg] results of the two studies lead to the following conclusion; (1) adding aerobic exercise to a caloric restriction program exacerbates losses of LBW (2) the additional of weight training to a program of mild caloric restriction results in specific regional muscular hyper trophy (3) weight training reduced strength gains are not addition of weight training to a program of mild caloric restriction results in maintenance of the LBW component (4) there is no diet by exercise interactions during weight loss. This suggests that the effects of diet and exercise are additive.

John\(^{31}\) (1970) selected thirty students to fit into one of the three-body fat group- 0-15%, 16-25% and 26% and above. The

behneke method for calculation of body fat was used to assign these students to a group. ANOVA for repeated measures was used to measure the internal consistency of these percentages of body fat. The 40 yards shuttle run was administered to each student ten times. ANOVA for repeated measure was used to measure the internal consistence of the traits. One way ANOVA indicated a significant effect of body fat upon performance of the 40 yards shuttle run. The new mankeula multiple comparison test identified the only significant difference between the 0-15% group and the 26% and above groups.

Wilmore (1996) provided an interview of the role of physical activity in the prevention of overweight and obesity and in the treatment of overweight and obese individuals. A secondary focus of his paper was on the potential mechanisms responsible for changes in body composition consequent to physical activity. The use of the term "physical activity" is preferred to the term "exercise" to better reflect a broader scope of movement, not limited to formal exercise regimes. A brief review of prospective studies that investigated alterations in body composition consequent to physical

activity alone was presented, along with discussion of the influence of genetic, macro-nutrients in the diet and characteristics of exercise programs on the magnitude of change observed in these studies. This is followed by a review of the specific role of chronic physical activity on energy intake, resting metabolic rate, the thermo effect of feeding, and the thermo effect of activity. Finally researchers discuss the role physical activity plays in presenting overweight and obesity and the most appropriate use of exercise in the management of overweight.

Charter and Phillips\(^3\) made a study on thee two years callisthenic and jogging program, which was used to evaluate changes in body composition of seven middle-aged men. Comparative data were also presented for six controls that were measured at the same 6-month intervals but did not take part in the exercise program. The exercisers participated in a supervised program 3 days per week. Initially, they walked and jogged for 10 minutes; therefore they jogged for 30 to 35 minutes. The average distance covered increased from 2.4 to 12.1 km per week, and the

total distance run per subject after 2 years of training averaged 1188km. (738 miles).

Compared with control subjects whose body composition remained constant during the 2 year period, the exercisers after first year significantly reduced their body mass (5.2%) sum of fat folds (27.4%) and girth measurement (3.1%) thereafter; there was little further changes in body mass and body composition. These results indicated that callisthenic and jogging significantly altered the physique of previously sedentary 40 to 60 year old men. The changes parallel 25% improvement in aerobic capacity.

Wixson (1983)\textsuperscript{34} determined the effects of a season of intercollegiate basketball, swimming, and volleyball on cardio respiratory endurance, percentage of body fat, flexibility and leg strength of female athletes. An additional purpose was to make a comparison among the three teams on their pre-season and post-season mean scores. The participants in this investigation were female athletes who were members of Trevecca Nazarene College volleyball team and Vanderbilt University basketball and swimming teams. Each volunteer subject was administered the following four

tests during a pre-season and post-season testing session: A strand-Rhyming Bicycle Ergo meter Test for cardio respiratory endurance, skin fold test for determining the percentage of body fat, a maximum leg strength test utilizing a load cell digital readout meter, and Leighton's flexometer tests for flexibility. The treatment intervention involved participation conditioning, training, and seasonal competitive schedules. The t test for repeated measures was used to compare the pre-season and post-season means scores to determine whether any significant changes occurred over the season of each team. A one way analysis of variance was used to compare mean pre-season and post-season scores among the teams. When differences were discovered, a Newman Keuls post hoc analysis was used to determine the nature of the relationship. Analysis of data revealed that following a season of training and competition: (a) The basketball team increased significantly in percentage of body fat and showed a significant loss in left leg strength and left shoulder flexibility; (B) athletes participating on the swimming variables under investigation and (C) the volleyball team showed a significant improvement in Max VO2, left leg strength, right and left wrist flexibility, and hip flexibility and a significant decrease in percentage of body fat, right and left shoulder flexibility, and left leg
flexibility. At the beginning of the season significant differences existed among the three teams for right and left leg flexibility.

Tanaka K\textsuperscript{35} conducted the study to test the effects on abdominal fat reduction of adding aerobic exercise training to a diet program and obesity phenotype in response to weight loss. DESIGN: A prospective clinical trial with a 14-week weight-loss intervention design. SETTING AND PARTICIPANTS: In total, 209 overweight and obese women were assigned to four subgroups depending on type of treatment and the subject's obesity phenotype: diet alone (DA) with intra-abdominal fat (IF) obesity (> or =mean IF area), diet plus exercise (DE) with IF obesity, DA with abdominal subcutaneous fat (ASF) obesity (<mean IF area) and DE with ASF obesity. Abdominal fat areas were evaluated by CT scans, with values adjusted for selected variables. RESULTS: Values were adjusted for age, menopausal status and change in body weight and total fat mass. The IF reductions were significantly (P<0.0001) greater in subjects with IF obesity phenotype (-45.1 cm\textsuperscript{2}) compared to the ASF obesity phenotype (-22.2 cm\textsuperscript{2}). The ASF reductions were significantly (P<0.001) greater for subjects with ASF obesity (-74.5

cm²) compared to IF obesity (-55.5 cm²). For IF obesity, the IF reduction was significantly (P<0.01) greater in the DE group (-49.3 cm²) than in the DA group (-37.8 cm²). CONCLUSION: These results suggest that for individuals with IF obesity, the efficacy on reducing IF of adding aerobic exercise training to a diet-alone weight-reduction program is more prominent (-49.3 cm²/-37.8 cm²=1.3 times) compared with DA. Moreover, abdominal fat reduction was found to be modified by obesity phenotype in response to weight loss.

Ahn36 analyzed the effects of aerobic exercise and yoga on body composition and lipid metabolism in abdominal obese women. Using one-group pre-test - post-test design, a convenience sample of 23 women who had abdominal obesity (greater than 32 inches of waist circumference) was recruited in a local area of P city and participated in 1 hour of aerobic exercise and yoga program twice a week for 12 weeks. Body composition was measured by body mass index, body fat ratio, waist and hip circumference, and waist-hip ratio; and lipid metabolism was measured with blood pressure, total

36 Sukhee Ahn, PhD, RN, Sunok Lee, PhD, RN, and Miok Kim, “Effects of Aerobic Exercise and Yoga Program on Body Composition and Lipid Metabolism in Abdominal Obese Women.” www.pubmed.gov, 20 July 2006: 1239-68.
cholesterol and triglycerides. At pre-test, mean age of the subjects was 48.7(SD=9.5) and body fat ratio was 33%, and waist-hip ratio was .85. By paired t-tests, waist circumference and waist-hip ratio were significantly decreased before and after the program but body mass index, blood pressure, and the level of lipid metabolism did not change. Further study findings and implication will be discussed.

Schoene\(^{37}\) conducted the study to test the hypothesis that exercise over 18 weeks in physical classes would be associated with a reduction in skinfold measurements and increased cardio vascular fitness. 87 male and female adolescent was taken for the study. Skinfold measurement was decreased in the regular physical education group, and skinfold measurement did not change in the control group during the study. In the sub group of 21 students who had vo2 max measured, submaximal heart rate decreased in aerobic group indicating on improvement in the cardio vascular fitness, but no change occurred in the control group.

Paul\(^{38}\) investigated the role of exercise and diet protocols on body composition in obese women. Effect sizes were computed


using the means and standard deviations reported in each study; theses were corrected for bias. Studies were coded based on the methodological features of age, treatment length, treatment mode, design features, reported significance of the study, and menopausal state. Twelve studies yielded 61 effect sizes for weight, percentage of body fat, and lean body weight. The results of this investigation demonstrated that a weight control program of diet alone, diet plus exercise, or exercise alone would have similar effects on weight and lean body weight in obese women. It also appears that a weight control program of diet plus exercise or exercise alone will result in lower percentage of body fat than will a weight control program of diet alone.

Judith39 investigated the influence of three types of aerobic exercises class (aerobics dance, water aerobics, and general fitness conditioning) on exercise self efficiency and perceived competence in overweight women (n=214). Data was analyzed using 2 X 3 MANCOVA on the pre-tests of the dependent variables to determine if differences existed between classes and overweight status. The multivariate main effect of class was borderline significant (P< 0.54)

and the multivariate main effect of overweight was significant (P<0.05). Using a 2 X 3 MANCOVA on the mean differences (pre-test – post-test) of the dependent variables no significant increases were found for self-efficacy, or perceived competence between classes or overweight status. The results of the study further shows that overweight women enrolled in the water aerobic class had lower perceptions of competence in physical fitness than those enrolled in aerobic dance and fitness conditioning. Individual who scored high in perceived competence also scored high in self-efficacy the results are limited by the non randomized nature of the study design.