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BODY IMAGE, MOVEMENT CONCEPT, AND BODY  
COMPOSITION OF OBESE COLLEGE WOMEN  
IN A WEIGHT REDUCTION PROGRAM

Elisabeth Pickelsimer Bradley

A dissertation presented to the  
Graduate Faculty of Middle Tennessee State University  
in partial fulfillment of the requirements  
for the degree Doctor of Arts

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BODY IMAGE, MOVEMENT CONCEPT, AND BODY  
COMPOSITION OF OBESE COLLEGE WOMEN  
IN A WEIGHT REDUCTION PROGRAM

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## ABSTRACT

### BODY IMAGE, MOVEMENT CONCEPT, AND BODY COMPOSITION OF OBESE COLLEGE WOMEN IN A WEIGHT REDUCTION PROGRAM

By Elisabeth Pickelsimer Bradley

The purpose of the study was to investigate the body image, movement concept, and body composition of thirty-two obese college women who participated in a weight reduction program. The program was designated as a special physical education course for a duration of fifteen weeks.

The study was conducted during the spring semester of 1975 at Middle Tennessee State University. Subjects possessed 30 percent body weight as fat to meet the minimum criterion set to be members of the special class. Included in this course were nutritional guidelines for dieting, group discussions, and an activity program.

Based on the work of Doudlah, Q-sorts were used to measure the two psychological variables, body image and movement concept. Subjects were administered the two Q-sort tests at the beginning of the semester and at the conclusion. The dependent  $t$  test of significance between means was used for within group analysis.

The Wilmore and Behnke regression equation was used to determine the lean body weights of the subjects at the beginning and at the conclusion of the semester. The five variables in the equation were total body weight, scapula skinfold, triceps skinfold, neck girth, and maximal abdominal girth. Changes in these variables and in percentage of body weight as fat were assessed as to statistical significance. The dependent t test of significance between means was used for the analysis within the weight reduction group.

As determined at the .05 level of significance, changes were not found between pre-test and post-test body image scores, nor were they found between movement concept scores. Significant changes did occur in the triceps and scapula skinfold measurements and in the abdominal circumference. Total body weight and percentage of body weight as fat were significantly reduced. Mean total body weight loss was 5.25 kilograms or 11.71 pounds.

#### CONCLUSIONS

Within the limitations of the study, the data obtained seem to justify the following conclusions:

1. Body image and movement concept did not change significantly as a result of this weight reduction program.

2. Percentage of body weight as fat and total body weight changed significantly as a result of this weight reduction program.

3. Significant reductions occurred for the scapula and triceps skinfold measurements and the maximal abdominal girth as a result of this weight reduction program.

### RECOMMENDATIONS

The following recommendations should be considered for future study to better determine the body image, movement concept, and body composition of obese college women in a weight reduction program:

1. Compare body image and movement concept of various body types to determine whether body image and movement concept are related to endomorphic, mesomorphic, and ectomorphic body types.
2. Use only obese subjects to devise a regression equation for determining lean body weight.
3. Duplicate the study using a similar group for controls.
4. Devise an aerobics chart which is graduated according to kilograms of body weight.
5. Study similar groups in which one group has only dietary information, one group has movement activities only, and one group has a combination of movement and diet.

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6. Revise the Q-sort test statements for body image and movement concept.

7. Duplicate the study using pre-teens, all males, or a coeducational group as subjects.

8. Assess the energy output of the subjects during the exercise program.

9. Conduct a longitudinal study so follow-up investigations can be made on the same subjects.

10. Provide obese students with a special physical education class where their needs may better be met.

11. Provide on-campus dietary selections of foods appropriate for students with special problems.

12. Duplicate the study using longer periods of time for class meetings.



## ACKNOWLEDGEMENTS

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## Chapter 1

### INTRODUCTION

Obesity, or complications from obesity, is considered to be the major health problem confronting the United States and other affluent nations.<sup>1</sup> Data reveal that obese persons, and in particular inactive obese persons, have a shorter life expectancy and are more susceptible to cardiovascular and degenerative diseases.<sup>2</sup> Diabetes, heart disease, high blood pressure, gall bladder disease, and respiratory disease are further complicated by the degree the individual is obese as evidenced from the Framingham study.<sup>3</sup>

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<sup>1</sup>George Bray, "Fogarty Center Conference on Obesity," American Journal of Clinical Nutrition, XXVII (April, 1974), 423.

<sup>2</sup>J. N. Morris and others, "Coronary Heart Disease and Physical Activity of Work," Lancet, II (1953), 1053-1057; R. S. Paffenbarger and others, "Work Activity of Longshoremen as Related to Death from Coronary Heart Disease and Stroke," New England Journal of Medicine, CCLXXXII (May 14, 1970), 1112-1113.

<sup>3</sup>Barbara McLaren, "Nutritional Control of Overweight," Canadian Journal of Public Health, LVIII (November, 1967), 483.



Dietary habits of Americans have changed since World War I.<sup>4</sup> Automation and improved methods of transportation have reduced the individual's daily energy output, while over the years caloric consumption has remained relatively the same.<sup>5</sup> Hence, "creeping obesity" often results.

As judged by current fashion standards, the obese individual is considered unattractive. The female regards obesity as a liability,<sup>6</sup> and concern about her figure may be attested by the amount of money which the American woman spends annually on diet products, figure salons, and weight reducing organizations.

Studies<sup>7</sup> have revealed that obese individuals were considerably inactive and consumed the same number, or even fewer, calories as individuals of normal weight. Therefore,

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<sup>4</sup>Lawrence E. Lamb, "Fitness for Life" (speech delivered to the first general session of the Southern District Health, Physical Education, and Recreation Convention, San Antonio, Texas, February 20, 1975).

<sup>5</sup>Penelope Peckos, "The Teenage Obesity Problem-- Why?", Food and Nutrition News, XLII (December-January, 1970-1971), 1.

<sup>6</sup>Joseph R. Buchanan, "Five Year Psychoanalytic Study of Obesity," American Journal of Psychoanalysis, XXXIII, No. 1 (1973), 33.

<sup>7</sup>Jetson E. Lincoln, "Calorie Intake, Obesity, and Physical Activity," American Journal of Clinical Nutrition, XXV (April, 1972), 390; Alexander Walker and Munirah Wadulla, "Diet, Overweight, and Inactivity in Rural African High School Girls," Transactions of the Royal Society of Tropical Medicine and Hygiene, LXVII (January, 1973), 143-144.

increased physical activity can play a major role in weight control.

Physical education, offered as an activity in many schools and colleges throughout the United States, provides the physical education student the opportunity to expend energy through various activities. However, in some physical education settings it is doubtful whether the needs of the obese student are being met.<sup>8</sup>

Negative attitudes about physical activity frequently are instilled in childhood. In the stunts and tumbling class, the heavy child, who always is placed on the bottom of the pyramid, and the heavy child, who is expected to do a headstand while at the same time she is unable to support her own body weight, may develop a dislike for this activity. Further examples are: (1) the large child who can not do a pull-up or a push-up while her slim peer seems to excel, (2) the figure conscious obese girl who is required to take swimming, and (3) the obese child who tries

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<sup>8</sup>Jean Mayer, "Inactivity as a Major Factor in Adolescent Obesity," Annals of the New York Academy of Sciences, CXXXI (October 8, 1965), 503; Jo Ann Krause, "Effects of an Appetite Suppressant and Exercise Upon Selected Physiological and Anthropometric Measurements in Overweight College Women" (unpublished Master's thesis, South Dakota State University, 1971), p. 1; Jean Mayer, "Physical Activity and Anthropometric Measurements of Obese Adolescents," Federation Proceedings, XXV (January-February, 1966), 11.

an activity but is unable to perform adequately and, hence, frequently is called the slang term "fatso" by her fellow students.

Unhappy experiences in their physical education classes have caused some students to develop a dislike for physical education programs.<sup>9</sup> If undesirable attitudes about physical education exist, the physical education teacher may have obstacles which will have to be overcome before the teaching-learning process can occur.<sup>10</sup>

Poor attitudes towards physical activity and diets which are high in calories often lead to greater degrees of obesity. These individuals, in turn, often raise children with these same attitudes.<sup>11</sup> Thus, obesity often perpetuates obesity.

Few researchers have dealt with developing programs of activities for persons who are physically handicapped by obesity. During physical education activities, these

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<sup>9</sup>Marion R. Broer, Katharine S. Fox, and Eunice Way, "Attitudes of University Women Students Toward Physical Education Activity," Research Quarterly, XXVI (December, 1955), 383.

<sup>10</sup>Martha G. Carr, "Relation Between Success in Physical Education and Selected Attitudes Expressed by High School Girls," Research Quarterly, XVI (October, 1945), 176-191.

<sup>11</sup>Beverly Bullen and others, "Attitudes Towards Physical Activity, Food and Family in Obese and Nonobese Adolescent Girls," American Journal of Clinical Nutrition, XII (January, 1963), 3-4.

individuals have been observed to be reticent about learning and participating in the organized activities.<sup>12</sup> Further, these people often tend to refrain from physical activities which in many instances would be beneficial in improving both their physical and psychological health. Obese individuals often have exhibited poor body images which have been improved by successful weight loss.<sup>13</sup> Movement through physical activity has been credited with helping to improve the individual's body image.<sup>14</sup> Weight control programs in physical education possibly can help the obese individual successfully lose weight and develop a better self image. For these reasons, some schools<sup>15</sup> and colleges<sup>16</sup> are offering obese students a special program where their needs may be better met.

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<sup>12</sup>Beverly Bullen, Robert Reed, and Jean Mayer, "Physical Activity of Obese and Nonobese Adolescent Girls Appraised by Motion Picture Sampling," American Journal of Clinical Nutrition, XIV (April, 1964), 220.

<sup>13</sup>Richard Rohrbacker, "Influence of a Special Camp Program for Obese Boys on Weight Loss, Self-Concept, and Body Image," Research Quarterly, XLIV (May, 1973), 156.

<sup>14</sup>Valerie Hunt, "Movement Behavior: A Model for Action," Quest, Monograph II (April, 1964), 84.

<sup>15</sup>Carl C. Seltzer and Jean Mayer, "An Effective Weight Control Program in a Public School System," American Journal of Public Health, LX (April, 1970), 679-689.

<sup>16</sup>Jack D. Osman, "Thirty Pounds and Three Credits Later," School Health Review, V (May-June, 1974), 22-25.

### STATEMENT OF THE PROBLEM

The study investigated the effects of being members of a special class for obese college women as membership in the special class related to (1) body image, (2) movement concept, and (3) body composition.

### PURPOSES OF THE STUDY

The study should give physical educators some insight into how better to meet the needs of college women who are physically handicapped by obesity. By understanding more deeply the needs of each student, the physical educator can strive to fulfill these needs through the media of physical activity and dietary modifications.

### DEFINITIONS OF TERMS

Body composition. For the purposes of this study, body composition was lean body weight and percentage of body weight as fat.

Body image. The mental picture the individual has of her physical body is referred to as body image.<sup>17</sup>

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<sup>17</sup>Sharon Stroble, "The Relationship Among Selected Measures of Physical Fitness, Body Image, Self-Concept, Movement-Concept and Selected Personality Traits of College Physical Education Majors with Low Physical Fitness Indices" (unpublished Master's thesis, University of North Carolina, Greensboro, 1964), p. 4.

Movement concept is the way in which an individual perceives herself as a physical mobile entity; a view which is influenced by the self-concept and the body image as known only to the individual.<sup>18</sup>

Obesity. For the purposes of this study, obesity was defined as an excess of thirty percent body weight as fat.

Q-sort is a psychological card sorting test which measures the discrepancy in the form of a correlation between an individual's own perception of her actual self and ideal self.<sup>19</sup> For this study, the Q-sort test set of statements consisted of seventy-five self-reference cards.

Special physical education class is a physical education class designed to meet the needs of the individual student.

#### BASIC ASSUMPTIONS

The following assumptions were basic to this investigation:

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<sup>18</sup>Anna May Doudlah, "The Relationship Between the Self-Concept, the Body-Image, and the Movement-Concept of College Freshmen Women with Low and Average Motor Ability" (unpublished Master's thesis, University of North Carolina, Greensboro, 1962), p. 6.

<sup>19</sup>William Stephenson, The Study of Behavior: Q-Technique and Its Methodology (Chicago: University of Chicago Press, 1953), p. 19.

1. Body image and movement concepts are psychological variables which affect behavior.

2. An individual's body image and movement concepts may be modified, and time allotted for this investigation will reflect some modification.

3. Subjects will adhere to a set program of physical activity and dietary modifications.

#### DELIMITATIONS

This study was delimited to the following:

1. A weight reduction group consisting of thirty-two subjects.

2. Two instruments to measure body image and movement concept: the Q-sort Body Image Test and the Q-sort Movement Concept Test.

3. An experimental treatment and testing period lasting thirty class meetings of fifty minutes each.

#### HYPOTHESES

The .05 level was used to determine significance of the following hypotheses:

H<sub>1</sub>: There will be a statistically significant change in body image of the special physical education class members.

H<sub>2</sub>: There will be a statistically significant change in movement concept of the special physical education class members.

H<sub>3</sub>: There will be a statistically significant change in total body weight of the special physical education class members.

H<sub>4</sub>: There will be a statistically significant change in percentage of body weight as fat of the special physical education class members.



## Chapter 2

### RELATED LITERATURE

The following discussion presents literature in five sections as it relates to the study. These sections are: (1) inactivity as the etiology of obesity; (2) physical education's role in relation to obesity control; (3) body composition; (4) body image, movement concept, and Q-technique; and (5) summary of related literature.

#### INACTIVITY AS THE ETIOLOGY OF OBESITY

Today's technology makes it difficult for an individual to expend as many calories as did her forebearers. Improved means of transportation, no physical chores, short or nonexistent physical education programs, or programs that do not require physical exertion are all factors which contribute to inactivity patterns which begin to develop early in life.<sup>1</sup> Inactivity often contributes to obesity. Obesity is seldom found in those who lead active lives and

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<sup>1</sup>Dorothy V. Harris, Involvement in Sport: A Somatopsychic Rationale for Physical Activity (Philadelphia: Lea & Febiger, 1973), p. 128.

follow occupations or recreations demanding hard physical exercise.<sup>2</sup>

Bruch<sup>3</sup> states obesity data which indicate that 20 to 30 percent of the population is obese, and obesity is much more common in women than in men. One finding from a study by Stunkard and Pestka<sup>4</sup> indicated that inactivity of women resulted from biological or social influences on them, and was not a function of their gender.

Infants, aged four to six months, were studied as to food intake, physical activity, and fatness. There was no correlation between fatness and food intake and none between growth and intake, but a marked correlation between physical activity and food intake. Activity was measured by the use of tiny pedometers strapped to the infants' limbs. Fat babies had small to moderate food intake but were hypoactive. Thin babies were active and a number of them had large food intakes.<sup>5</sup>

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<sup>2</sup>Stanley Davidson and Robert Passmore, Human Nutrition and Dietetics (Baltimore: The Williams and Wilkins Company, 1966), p. 362.

<sup>3</sup>Hilda Bruch, Eating Disorders (New York: Basic Books, Inc., 1973), pp. 109, 117.

<sup>4</sup>Albert Stunkard and Joan Pestka, "The Physical Activity of Obese Girls," American Journal of Diseases of Children, CIII (June, 1962), 116-121.

<sup>5</sup>Hedwig Rose and Jean Mayer, "Activity, Calorie Intake, Fat Storage, and the Energy Balance of Infants," Pediatrics, XLI (January, 1968), 18-29.

Investigations by Bruch<sup>6</sup> which were concerned with living habits of obese children indicated that they were inactive in games and athletics and preferred sedentary occupations. Of the 160 obese children she studied, 76 percent of the boys and 68 percent of the girls were physically inactive. Many not only were disinclined toward activity, but evidenced a fear of learning anything which required muscular skill or exertion. Seventy percent of these children had a below normal amount of energy released through muscular exercise; and 80 percent of these obese children had food intakes exceeding those of nonobese children. Bruch also noted that the emotional life experiences of these children had not permitted the normal development of muscular function or enjoyment of active sports and social relationships.

Corbin and Pletcher<sup>7</sup> supported the contention that inactivity may be as important or more important than

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<sup>6</sup>Hilda Bruch, "Obesity in Childhood II. Physiological and Psychological Aspects of the Food Intake of Obese Children," American Journal of Diseases of Children, LIX (April, 1940), 739-781; Hilda Bruch, "Obesity in Childhood IV. Energy Expenditure of Obese Children," American Journal of Diseases of Children, LX (November, 1940), 1082-1109.

<sup>7</sup>Charles B. Corbin and Philip Pletcher, "Diet and Physical Activity Patterns of Obese and Nonobese Elementary School Children," Research Quarterly, XXXIX (December, 1968), 922-928.

excessive caloric intake in the development and maintenance of childhood obesity. This was based on an investigation of caloric intake and physical activity patterns of fifty fifth grade children. Their subjects had relatively similar diets regardless of body fat, but the obese youngsters were more inactive.

Physical inactivity also was characteristic of obese individuals studied by Rony<sup>8</sup> and by Bronstein and others.<sup>9</sup> Fry<sup>10</sup> and Peckos,<sup>11</sup> from their studies, reported physical inactivity was more pronounced than overeating in the etiology of obesity in children.

Mayer<sup>12</sup> says that participation in a daily forty-five minute to one hour program of appropriate physical activity is highly effective in reducing obesity in childhood and adolescence. Activities should be those which

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<sup>8</sup>H. R. Rony, Obesity and Leanness (Philadelphia: Lea & Febiger, 1940).

<sup>9</sup>I. P. Bronstein and others, "Obesity in Childhood," American Journal of Diseases of Children, LXVI (February, 1942), 238-251.

<sup>10</sup>Peggy C. Fry, "A Comparative Study of 'Obese' Children Selected on the Basis of Fat Pads," Journal of Clinical Nutrition, I (September-October, 1953), 453-468.

<sup>11</sup>Penelope Peckos, "Calorie Intake in Relation to Physique in Children," Science, CXVII (June 5, 1953), 631-633.

<sup>12</sup>Jean Mayer, "Heart Disease: Plans for Action," Nutrition Policies in the Seventies (San Francisco: W. H. Freeman and Company, 1973), pp. 48, 51.

can be carried on throughout life and those that entail a maximum amount of cardiovascular training.

Contradicting Mayer is Heald<sup>13</sup> who states that no one yet has presented convincing evidence which indicates that exercise alone will adequately control weight. Success in weight control can come only through long-term moderate reduction of calorie intake.

The onset of excessive weight gain among obese children in the public schools of Newton and Brookline, Massachusetts, generally occurred during the winter months. Johnson, Burke, and Mayer<sup>14</sup> suggest this may be taken as emphasizing the importance of inactivity in the etiology of obesity.

Mocellin and Rutenfranz<sup>15</sup> found obese Scandinavian children who displayed shortness of breath when climbing stairs and a general decrease in physical work capacity as their degree of obesity increased. Observations by the authors revealed that obese children who were 40 percent or

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<sup>13</sup>Felix P. Heald, "Treatment of Obesity in Adolescence," Postgraduate Medicine, LI (May, 1972), 109-112.

<sup>14</sup>M. L. Johnson, B. S. Burke, and J. Mayer, "The Prevalence and Incidence of Obesity in a Cross-Section of Elementary and Secondary School Children," American Journal of Clinical Nutrition, IV (May-June, 1956), 231-238.

<sup>15</sup>R. Mocellin and J. Rutenfranz, "Investigations of the Physical Working Capacity of Obese Children," Acta Paediatrica Scandinavica, CCXVII, Supplement (September 30-October 1, 1971), 77-79.

more overweight had a substantially reduced physical work capacity. Hence, these children became more inactive in order to avoid work.

Parižkova and others<sup>16</sup> studied twenty-two obese children. Physical activity of these Prague children was found to be low when compared to the activity of nonobese children.

In a similar study, Johnson, Burke, and Mayer<sup>17</sup> found inactivity was of greater importance than overeating in the development of obesity. An attempt was made to compare the caloric intake and activity of twenty-eight paired obese high school girls with girls of normal weight. Dietary histories and activity schedules were conducted for a year prior to the study. Subjects were asked how much time, daily or weekly, they devoted to each listed activity. Findings indicated that suburban high school girls were not active. The nonobese group showed little time devoted to participation in active sports, and during the school term a minimum amount of time was devoted to walking or to other

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<sup>16</sup>Jana Parižkova and others, "Body Composition and Fitness in Obese Children Before and After Special Treatment," Acta Paediatrica Scandinavica, CCXVII, Supplement (September 30-October 1, 1971), 80-85.

<sup>17</sup>M. L. Johnson, B. S. Burke, and J. Mayer, "Relative Importance of Inactivity and Overeating in the Energy Balance of Obese High School Girls," American Journal of Clinical Nutrition, IV (January, 1956), 37-43.

physical activity. The obese group was more inactive. Time spent by the obese group on sports or any sort of exercise was half that of the nonobese. Caloric intake was larger in the nonobese group than in the obese.

Bullen and others<sup>18</sup> studied the attitudes of 115 obese adolescent girls towards activity and eating. Obese girls seemed to be aware that they were inactive, although they had no concept of the degree of their inactivity. They seemed unaware that they might not like physical activity or there might have been a relationship between inactivity and obesity. Obese subjects said that they ate more than others and thought this was the cause of their obesity.

For four years, 1961 to 1965, Huenemann and her associates<sup>19</sup> studied 122 high school subjects who were matched according to percentage of body fat. These subjects kept detailed seven-day records of food intake and activity four times during the last two years of the study. Their seven-day records showed lower mean caloric intake for the somewhat obese and obese girls than for those in other categories.

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<sup>18</sup>Beverly Bullen and others, "Attitudes Towards Physical Activity, Food and Family in Obese and Nonobese Adolescent Girls," American Journal of Clinical Nutrition, XII (January, 1963), 1-11.

<sup>19</sup>Ruth L. Huenemann, "Food Habits of Obese and Nonobese Adolescents," Postgraduate Medicine, LI (May, 1972), 99-105.

Findings that ten obese and ten nonobese adolescent subjects consumed approximately the same number of calories were made by Hammar and others.<sup>20</sup> However, nonobese subjects were much more active than obese.

Walker and Wadvalla<sup>21</sup> say that, in primitive and rural peasant populations, overweight is infrequent. But when the diet and manner of sophisticated populations is adopted, overweight becomes common. They studied 650 high school girls, aged thirteen to twenty-one. These black girls averaged weighing twelve pounds more than their white peers. Inactivity was attributed as being the reason for the overweight and not their diet. These overweight girls had no program of regular physical activity, while their white peers had a regular exercise program.

A motion picture technique was used to compare the activity of obese and nonobese adolescent girls while they engaged in three sports at two summer camps. Percentage of time spent motionless and energy expenditure were calculated on the basis of type and speed of locomotion and intensity of other movement. On the basis of 27,211 individual

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<sup>20</sup>S. L. Hammar and others, "An Interdisciplinary Study of Adolescent Obesity," Journal of Pediatrics, LXXX (March, 1972), 373-383.

<sup>21</sup>Alexander Walker and Munirah Wadvalla, "Diet, Overweight, and Inactivity in Rural African High School Girls," Transactions of the Royal Society of Tropical Medicine and Hygiene, LXVII (January, 1973), 143-144.



observations, Bullen, Reed, and Mayer<sup>22</sup> concluded that obese girls were far less active than nonobese girls during supervised sport periods.

Using a group of twenty-two overweight college women, Schade and others<sup>23</sup> concluded that daily contact with their subjects seemed to suggest underactivity was and had been a greater factor in their excess weight than overeating. Using overweight college women as subjects, Tufts<sup>24</sup> found students who showed a shift in caloric consumption toward evening when they were least active.

Supporting this finding was Young<sup>25</sup> who states that, with no scheduled lunch hour, there was a tendency for college classes to continue through lunch time. She also found that, when campus housing arrangements included compulsory meal contracts, obese students had difficulty in

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<sup>22</sup>B. A. Bullen, R. B. Reed, and J. Mayer, "Physical Activity of Obese and Nonobese Adolescent Girls Appraised by Motion Picture Sampling," American Journal of Clinical Nutrition, XIV (April, 1964), 211-223.

<sup>23</sup>Maja Schade and others, "Spot Reducing in Overweight College Women: Its Influence on Fat Distribution as Determined by Photography," Research Quarterly, XXX (October, 1962), 461-471.

<sup>24</sup>Sharon Anne Tufts, "The Effects of Diet and Physical Activity on Selected Measures of College Women" (unpublished Doctoral dissertation, University of Iowa, 1969), p. 74.

<sup>25</sup>Charlotte M. Young, "Weight Control in a College Situation," Postgraduate Medicine, LI (May, 1972), 116-120.

selecting a low calorie diet and were tempted to eat what had been paid for, with frequent weight gain.

Prentiss<sup>26</sup> found her obese college women subjects ate little for breakfast, but usually ate normal lunches and dinners. Her normal weight control subjects tended to eat three regular meals. Obese subjects were much less active than normal weight subjects.

One of the classical studies on obesity was conducted by Greene.<sup>27</sup> Most of his 350 subjects were inactive because of a long illness or convalescence. Inactivity occurred simultaneously with gain in body weight in 67.5 percent of the cases, and a history of increased food intake was found in only 3.2 percent.

Bloom and Eidex<sup>28</sup> studied the daily activities of seven obese and six lean subjects by recording time in bed, time out of bed, and time standing. Obese subjects spent

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<sup>26</sup>Gail Prentiss, "The Effect of a Progressive Program of Exercycle Exercise on the Cardio-Respiratory Endurance and Anthropometric Measurements of Obese College Women" (unpublished Master's thesis, University of Washington, 1964), p. 109.

<sup>27</sup>James A. Greene, "Clinical Study of the Etiology of Obesity," Annals of Internal Medicine, XII (May, 1939), 1797-1803.

<sup>28</sup>Walter Bloom and Marshall F. Eidex, "Inactivity as a Major Factor in Adult Obesity," Metabolism, XVI (August, 1967), 679-684.

15 percent less time each day on their feet, 17 percent less time out of bed on their feet, and spent significantly more time in bed than the lean subjects.

Activity and attitudes toward activity of fifteen obese women were compared with those of a group of fifteen women of normal weight. Dorris and Stunkard<sup>29</sup> measured physical activity by a calibrated pedometer which each subject wore on her upper thigh for a period of one week. Subjects' overt and covert attitudes toward activity were assessed by a direct questionnaire and by a specially devised sentence-completion test which measured the subjects' self-images. Pedometer measurements indicated these obese women walked less than half as much as their nonobese controls. Attitudes toward physical activity of these women showed a significant difference between the two groups. The authors concluded their study with the recommendation that increased activity be used in the treatment of obesity.

Substantiating these findings was Swanson and others.<sup>30</sup> Over twenty years ago, they were reporting

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<sup>29</sup>Ronald J. Dorris and Albert J. Stunkard, "Physical Activity: Performance and Attitudes of a Group of Obese Women," American Journal of the Medical Sciences, CCXXXIII (June, 1957), 622-628.

<sup>30</sup>Pearl Swanson and others, "Food Intake and Body Weight of Older Women," Weight Control: A Collection of Papers Presented at the Weight Control Colloquium (Ames, Iowa: Iowa State College Press, 1955), pp. 80-96.

inactivity as part of the reason for weight problems in women thirty years and older.

According to Mayer,<sup>31</sup> two misconceptions about exercise must be expelled in order to persuade individuals to be active as a means to control obesity. These misconceptions are (1) exercise requires relatively little caloric expenditure and, therefore, increased physical activity hardly changes the caloric balance, and (2) an increase in physical activity always is followed by an increase in appetite and food intake and may, therefore, actually impair weight reduction.

The task is left to physical educators to expel these two misconceptions because physical inactivity clearly has been shown to be a factor in the etiology of obesity. Physical educators must motivate students who have obesity problems to engage in proper lifetime activities to help control their weights.

#### PHYSICAL EDUCATION'S ROLE IN RELATION TO OBESITY CONTROL

I wonder why so much of the education designed to reduce the incidence of obesity is centered on food

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<sup>31</sup>Jean Mayer, "The Role of Exercise and Activity in Weight Control," Weight Control: A Collection of Papers Presented at the Weight Control Colloquium (Ames, Iowa: Iowa State College Press, 1955), pp. 199-210.

rather than on activity. Is it assumed food habits may be modified more easily than those of physical activity?<sup>32</sup>

Heald and Khan<sup>33</sup> say there is recent evidence that the incidence of obesity in our adolescent population is actually increasing. Since most students take physical education activity courses, physical education may be able to help some of the students who have weight problems. In some situations, programs of weight control for the obese child or adolescent already have been adopted in some schools. Such programs have demonstrated the feasibility of incorporating special classes and guidance in nutrition and of providing physical education activities beyond the regular required programs.<sup>34</sup>

The average student who plays a half hour of handball or squash per day could expend the equivalent of sixteen pounds of body weight per year.<sup>35</sup> Just by walking

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<sup>32</sup>Hortense Powdermaker, "An Anthropological Approach to the Problem of Obesity," The Psychology of Obesity, ed. Norman Kiell (Springfield, Illinois: Charles C. Thomas, 1973), p. 75.

<sup>33</sup>Felix Heald and Mushtag Ahmad Khan, "Teenage Obesity," Pediatric Clinics of North America, XX (November, 1973), 807.

<sup>34</sup>Jean Mayer and Beverly Bullen, "Nutrition, Weight Control, and Exercise," Science and Medicine of Exercise and Sport, eds. Warren R. Johnson and Elsworth R. Buskirk (New York: Harper & Row, 1974), pp. 272-273.

<sup>35</sup>Jean Mayer, "Multiple Etiology of Obesity," Physiological Reviews, XXXIII (October, 1953), 499.

hard for one-half hour in the morning and again in the evening, an obese person may burn off one ounce of fat. If this procedure is continued for a year, over twenty pounds of fat or its equivalent will be oxidized.<sup>36</sup> Swimming or playing tennis for an hour will utilize approximately 700 calories.<sup>37</sup> In a year, this could mean the equivalent of seventy-three pounds.

Unfortunately, a number of school systems have dropped the requirement for physical education. Even "sketchy physical exercise" programs may have benefited the overweight students.<sup>38</sup>

Most of the literature is not favorable concerning physical education's present role in helping obese students to overcome their handicaps. Mayer<sup>39</sup> says our school physical education programs are short and inadequate and are geared primarily to the physically fit, not to handicapped students as the obese. He adds that the physical education

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<sup>36</sup>Robert Passmore, "Daily Energy Expenditure in Man," Proceedings of the Nutrition Society, XV (July 8, 1956), 89.

<sup>37</sup>A. M. Bryans, "Childhood Obesity--Prelude to Adult Obesity," Canadian Journal of Public Health, LVIII (November, 1967), 487.

<sup>38</sup>Jean Mayer, "Fat Babies Grow Into Fat People," Family Health, V (March, 1973), 24.

<sup>39</sup>Jean Mayer, "Weight Control in Public School Children," Postgraduate Medicine, XLV (June, 1969), 269.

set-up in most of our schools is miserable for any student who does not "make a team."<sup>40</sup> Pressure and cooperation from the school physician and school practitioners are needed to broaden physical education programs which then will be valuable agents in preventive medicine.<sup>41</sup> In addition, every high school in the United States should have an Olympic size swimming pool, tennis courts, and a sufficient number of well trained health-minded physical educators.<sup>42</sup>

Corbin and Pletcher<sup>43</sup> criticized physical education programs from their study of diet and physical activity patterns of fifty fifth-grade elementary children. As expected, they found pronounced inactivity characteristic of the obese. In addition, they found all subjects were less active in the organized physical education class than in free play or unorganized situations. They suggested that more careful selection of activities be made if vigorous activity is desired.

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<sup>40</sup>Jean Mayer, "Obesity, Cardiovascular Diseases, and the Dietitian," Journal of the American Dietetic Association, LII (January, 1968), 30.

<sup>41</sup>Mayer, "Weight Control in Public School Children."

<sup>42</sup>Mayer, "Heart Disease: Plans for Action," p. 51.

<sup>43</sup>Corbin and Pletcher, "Diet and Physical Activity Patterns of Obese and Nonobese Elementary School Children."

A study<sup>44</sup> was conducted in Holland on the relation between physical performance capacity and obesity and the effects of obesity on physical education in school. Subjects were 1,126 boys and girls, aged from six to eighteen. Children of normal weight and children who were slightly underweight achieved the best marks in physical education. One of the authors' conclusions was that the usual method of giving marks in physical education must be changed and obese children motivated to take part in sports.

In agreement with this suggestion is Harris<sup>45</sup> who says that physical educators have the responsibility of providing programs of vigorous exercise for all age groups. Close attention must be directed to youngsters who are overweight, motivating them to increase activity to assist in the prevention of obesity.

Piscopo<sup>46</sup> advocates an interdisciplinary approach between health educators and physical educators to help the vicious cycle of "creeping obesity." In relation to

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<sup>44</sup>Hans-Jürgen Rehns, Inge Berndt, and Joseph Rutenfranz, "Untersuchungen zur Frage der Leistungsfähigkeit Adipöser unter besonderer Berücksichtigung des Sportunterrichtes" [Study of the Physical Performance Capacity of Obese Subjects with Special Reference to Physical Education], Zeitschrift für Kinderheilkunde, CXV (August 9, 1973), 23-39.

<sup>45</sup>Harris, Involvement in Sport: A Somatopsychic Rationale for Physical Activity, pp. 125-126.

<sup>46</sup>John Piscopo, "Obesity: An Interdisciplinary Approach to a Major Health Problem," Physical Educator, XXVII (March, 1970), 27.



this, Osman<sup>47</sup> says that the most logical person to teach a weight control class for overweight college students is the health educator who was converted from physical education; or, better yet, a person who is "able to leap tall buildings in a single bound."

Seltzer and Mayer<sup>48</sup> remark that physical education departments presently favor those youngsters who are highly motivated and would exercise anyway and neglect those who need it the most, such as the overweight. They suggest that physical education departments need to make a complete reversal. All public school systems at all levels need weight control programs. Physical educators have the primary responsibility for this program with the cooperation and supervision of the school physicians, school nurses, and community health departments.

For three years, a program of weight control for obese students was supervised by Seltzer and Mayer<sup>49</sup> in elementary and junior high grades of the public schools in Newton, Massachusetts. Daily forty-five minute physical

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<sup>47</sup>Jack D. Osman, "Thirty Pounds and Three Credits Later," School Health Review, V (May-June, 1974), 25.

<sup>48</sup>Carl C. Seltzer and Jean Mayer, "An Effective Weight Control Program in a Public School System," American Journal of Public Health, LX (April, 1970), 689.

<sup>49</sup>Seltzer and Mayer, 679-689.

education classes, nutrition education, and psychological support were components of the program provided for 189 obese students. Controls were 161 obese youngsters. The program lasted five months with no attempt made to place dietary restrictions on the growing subjects. Triceps skinfold measurements was the criterion as to whether these students were losing fat. The elementary and junior high control groups of boys and girls had increases in the triceps skinfolds, while the elementary and junior high exercised groups of girls either remained the same or decreased. Both boys' exercised groups decreased in the triceps skinfolds. The authors concluded that this was a successful program.

While studying the activity of teenagers, Shapiro, Hampton, and Huenemann<sup>50</sup> were unable to find any measurable difference in physical activity between the obese and the nonobese because the students were so inactive. They found, however, that physical education during the school year did make an important contribution to the physical activity of the student who was physically lethargic. Physical education made little or no difference for the activity oriented student.

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<sup>50</sup>Leona Shapiro, Mary Hampton, and Ruth L. Huenemann, "Teenagers: Their Body Size and Shape, Food, and Activity," Journal of School Health, XXXVII (April, 1967), 168.

Johnson<sup>51</sup> studied fifteen obese male college students by placing them in an adaptive physical education program. One of his findings was that the subjects showed significant gains in attitude toward physical activities when they were placed in an adapted program instead of a regular college physical education class. Most of the experimental subjects expressed a desire for a similar program in physical education to be made available to them the following school year. He also found that the group approach was good in motivating the obese students to being active.

Physical educators need to take maximum performance abilities into consideration before assigning marks. Blackinton<sup>52</sup> classified 1,732 college women according to height and weight and administered the Scott Motor Ability Test to them. She found that women classified as heavy for their heights consistently did the poorest on the motor ability test. Hence, obesity had been a handicap to the students' performances.

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<sup>51</sup>Leon E. Johnson, "An Experimental Study of the Obese Individual in Physical Education" (unpublished Doctoral dissertation, West Virginia University, 1968).

<sup>52</sup>Marion Blackinton, "The Value of a Height-Weight Classification Plan as a Predictor of the Motor Ability of College Women" (unpublished Doctoral dissertation, University of Utah, 1965).

Possessing a positive outlook on physical education's role in weight control are Roby and Reuter<sup>53</sup> who report that a weight loss of twenty to twenty-five pounds per student was not uncommon by students who were enrolled in a sixteen-week university weight control class. They also report that there is an increased prevalence of overweight students on college campuses today who can be helped by college physical education departments which establish a course in the basic instructional program specifically designed to help the overweight student.

Pointed out in the pamphlet, Obesity and Health,<sup>54</sup> was the fact that graduation from school and college often marks the end of regular physical activity for students because they no longer have easy access to athletic facilities.

In summary, physical educators must convince their students of the importance of engaging in some form of regular physical activity. Then these students will find facilities in which to be active and obesity possibly can be controlled for the rest of their lives.

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<sup>53</sup>Frederick Roby and E. R. Reuter, "Weight Control Course," Journal of Health, Physical Education, and Recreation, XXXIII (March, 1962), 22-23.

<sup>54</sup>Jean Mayer (ed.), Obesity and Health, U.S. Department of Health, Education, and Welfare, U.S. Government Printing Office, Washington, D.C., Public Health Service Publication No. 1485, 1966, p. 43.

## BODY COMPOSITION

"One cannot go to height-weight tables and find desirable weights."<sup>55</sup> Through necessity, researchers have developed other methods. Body fat has been measured with equipment as simple and inexpensive as a tape measure and skinfold calipers or as sophisticated and costly as whole body scintillation counters and ultrasonic devices. Determining which method to use to assess body composition seems to be a controversial subject among investigators.

### Anthropometric Methods of Determining Body Composition

Since many athletes were rejected by the armed forces because they exceeded the "desirable" weight, Behnke, Feen, and Welham<sup>56</sup> studied the problem. In Behnke's investigations of body composition, he divided the body into a fat and a fat-free component (lean body weight, LBW). From this, Behnke could estimate the subject's percentage of body weight which was fat. Since his initial work, other

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<sup>55</sup>Herbert de Vries, "Physiology of Exercise," speech delivered at the American Alliance for Health, Physical Education, and Recreation National Convention, Atlantic City, N.J., March 16, 1975.

<sup>56</sup>A. R. Behnke, B. G. Feen, and W. C. Welham, "Specific Gravity of Healthy Men," Journal of the American Medical Association, CXVIII, No. 6 (1942), 495-498.

equations have been derived to predict total body fat and body density.

Measurement of skinfold thicknesses is one method used in the determination of an individual's subcutaneous fat. Skinfold thicknesses are valid through the fifth decade of life, but not thereafter, according to Young.<sup>57</sup> Obese persons have approximately two-thirds of the excess adiposity located just beneath the skin.<sup>58</sup>

The Committee on Nutritional Anthropology of the Food and Nutrition Board of the National Research Council<sup>59</sup> state that the skinfold of the upper arm, halfway between the acromion process and the tip of the elbow on the posterior line, is the best site because of its accessibility. The arm should hang at the side when the measurement is taken, with the skin lifted parallel to the long axis of the arm. This site should be located with the arm flexed at a ninety degree angle. The second recommended

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<sup>57</sup>Charlotte M. Young, "Body Fatness in Normal 'Older' Women," New York State Journal of Medicine, LXIII (July 15, 1963), 2121-2123.

<sup>58</sup>T. H. Allen and others, "Prediction of Total Adiposity from Skinfolts and the Curvilinear Relationship Between External and Internal Adiposity," Metabolism, V (May, 1956), 346-352.

<sup>59</sup>Ancel Keys, "Recommendations Concerning Body Measurement for the Characterization of Nutritional Status," Body Measurements and Human Nutrition, ed. Josef Brozek (Detroit, Michigan: Wayne University Press, 1956), pp. 10-11.

site is at the right subscapular location because the tissue in this area varies little.

Sills<sup>60</sup> cautions, when taking skinfold measurements, that it is important not to repeat the measurement over the same area within a short period of time. Particularly on overweight subjects, successive measurements may be taken and a smaller measurement obtained each time.

Moody, Kollias, and Buskirk<sup>61</sup> studied eleven overweight college women. They found that the skinfold method, by itself, was inappropriate for assessing reduction in the total body fat of their subjects.

Concerning the selection of skinfold sites, Keys and Brožek<sup>62</sup> state that the location and the number of sites selected depend upon the purpose for which they are taken. They feel the selected sites should represent regions which commonly show large variations in adipose tissue, extremities should be represented, and the sites should be easily located. They list three sites which satisfy the

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<sup>60</sup>Frank D. Sills, "Anthropometry in Relation to Physical Education," Science and Medicine of Exercise and Sport, eds. Warren R. Johnson and Elsworth R. Buskirk (New York: Harper & Row, 1974), p. 26.

<sup>61</sup>D. L. Moody, J. Kollias, and E. R. Buskirk, "The Effects of a Moderate Exercise Program on Body Weight and Skinfold Thicknesses on Overweight College Women," Medicine and Science in Sports, I (Summer, 1969), 75-80.

<sup>62</sup>Ancel Keys and Josef Brožek, "Body Fat in Adult Man," Physiological Reviews, XXXIII (July, 1953), 245-325.

specified criteria and are the most favorable for use in surveys and for practical purposes. These sites include the upper arm on the posterior line halfway between the elbow and the tip of the shoulder, below the scapula, and above the iliac crest on the midaxillary line.

In a study of sixty-four college women, Katch and Michael<sup>63</sup> used skinfold measurements, girth measurements, and bone diameters. Results of these measurements were correlated with body density obtained by underwater weighing. They found two skinfolds (triceps and scapula) and two girths (buttock and upper arm) yielded a correlation of .70 and additional measures did not raise the correlation significantly.

Using five skinfolds, thirteen circumferences, and eight bone diameter measurements on sixty-nine college women subjects, Katch and McArdle<sup>64</sup> found the iliac and scapula skinfolds, elbow diameter, and thigh girth were the best predictors of density. The authors also found that, when put into regression equations, the circumference

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<sup>63</sup>Frank I. Katch and Ernest D. Michael, "Prediction of Body Density from Skinfold and Girth Measurements of College Females," Journal of Applied Physiology, XXV (July, 1968), 92-94.

<sup>64</sup>Frank I. Katch and William D. McArdle, "Prediction of Body Density from Simple Anthropometric Measurements in College-Age Men and Women," Human Biology, VL (September, 1973), 445-454.



measurements of arm, abdomen, forearm, and thigh were as accurate at predicting density as were the skinfolds of triceps, scapula, iliac, abdomen, and thigh.

At the Fels Research Institute, Garn<sup>65</sup> studied fat deposits and body densities by use of soft tissue X-rays of 107 female subjects, aged twenty to sixty years. He reported that the iliac crest measurement was the best single predictor of total body fat in women.

Sloan, Burt, and Blyth<sup>66</sup> confirmed Garn's finding by reporting that the iliac crest measurement showed the highest correlation with composite criterion of skinfolds which was .92. The best single predictor of body density was from skinfold measurements over the iliac crest and the triceps which gave a multiple correlation of .74.

Von Döbeln<sup>67</sup> correlated anthropometric measures with fat-free weight or lean body weight with males and females. He found height, femoral condylar breadth, and bistyloid radio-ulnar breadth could be used for estimating lean body weight in young, healthy subjects.

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<sup>65</sup>Stanley M. Garn, "Fat Weight and Fat Placement in the Female," Science, CXXV (May 31, 1957), 1091-1092.

<sup>66</sup>A. W. Sloan, J. J. Burt, and Carl Blyth, "Estimation of Body Fat in Young Women," Journal of Applied Physiology, XVII (November, 1962), 967-970.

<sup>67</sup>W. von Döbeln, "Fat-Free Body Weight of Swedish Air Force Pilots," Aerospace Medicine, XXXII (January, 1961), 67-69.

The triceps skinfold measurement was found by Seltzer, Goldman, and Mayer<sup>68</sup> to be the best predictor of body density in obese adolescent girls, aged twelve to eighteen. This skinfold gave the highest correlation value with body density which was determined by underwater weighing. Katch and Michael<sup>69</sup> also reported this finding.

Durnin and Rahaman<sup>70</sup> reported good correlations between density and the sum of the triceps, biceps, scapula, and iliac skinfolds. Young and others<sup>71</sup> found that the pubis skinfold measurement and height and weight from actuarial tables gave the highest correlation with density.

A study conducted by Wilmore and Behnke,<sup>72</sup> using a sample of 128 college-age females, indicated body density

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<sup>68</sup>Carl C. Seltzer, Ralph F. Goldman, and Jean Mayer, "The Triceps Skinfold as a Predictive Measure of Body Density and Body Fat in Obese Adolescent Girls," Pediatrics, XXXVI (August, 1965), 212-218.

<sup>69</sup>Katch and Michael, 445-454.

<sup>70</sup>J. V. G. A. Durnin and G. A. Rahaman, "The Assessment of the Amount of Fat in the Human Body from Measurements of Skinfold Thicknesses," British Journal of Nutrition, XXI, No. 3 (1967), 681-689.

<sup>71</sup>C. M. Young and others, "Predicting Specific Gravity and Body Fatness in Young Women," Journal of the American Dietetic Association, XL (February, 1962), 102-107.

<sup>72</sup>Jack H. Wilmore and Albert R. Behnke, "An Anthropometric Estimation of Body Density and Lean Body Weight in Young Women," American Journal of Clinical Nutrition, XXIII (March, 1970), 267-274.

could be estimated from regression equations containing only five anthropometric measurements from a total of fifty-four measured sites. Lean body weight was predicted from five measurements consisting of the triceps and subscapular skin-folds, neck and maximal abdominal circumferences, and body weight which gave a multiple correlation of .93.

Katch and McArdle<sup>73</sup> determined the validity of fourteen regression equations used to predict body density of college-age men and women. They found lean body weight (LBW) for their sixty-nine women subjects was best predicted by the Wilmore and Behnke formula.

Percentages of Body Weight  
as Fat of Women Subjects

Brožek and others<sup>74</sup> say that the normal woman has 19 to 23 percent body fat. The mean percentage of body fat was 25.65 for fifteen females enrolled in a weight control class at the University of Iowa.<sup>75</sup> Garn<sup>76</sup> found that his

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<sup>73</sup>Frank Katch and William McArdle, "Validity of Body Composition Prediction Equations for College Men and Women," American Journal of Clinical Nutrition, XXVIII (February, 1975), 105-109.

<sup>74</sup>Josef Brožek and others, "Densitometric Analysis of Body Composition: Revision of Some Quantitative Assumptions," Annals of the New York Academy of Sciences, CX (September 26, 1963), 115.

<sup>75</sup>Tufts, "The Effects of Diet and Physical Activity on Selected Measures of College Women," p. 64.

<sup>76</sup>Garn, 1091.

subjects possessed an average of 25.6 percent body fat. Clauser and others<sup>77</sup> reported that fifty-five college-age women had a mean of 27.8 percent body fat. Lesser, Keutsch, and Markofsky<sup>78</sup> found that ten women, aged sixteen to thirty-eight had a mean of 23.7 percent body fat. Von Döbeln<sup>79</sup> found sixteen healthy women physical education students, aged nineteen to thirty-three, who showed 20 percent body fat.

Young and others<sup>80</sup> reported a mean value of 28.7 percent body fat in their subjects. Katch and Michael<sup>81</sup> reported a mean value of 21.5 percent body fat in the sixty-four college women they studied. Dill and others<sup>82</sup> found that seventeen school girls, aged fifteen to eighteen, had

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<sup>77</sup>C. E. Clauser and others, "Anthropometry of Air Force Women," AMRL-TR-70-5, Wright Patterson Air Force Base, Ohio.

<sup>78</sup>Gerson T. Lesser, Stanley Deutsch, and Jules Markofsky, "Use of Independent Measurement of Body Fat to Evaluate Overweight and Underweight," Metabolism, XX (August, 1971), 792-804.

<sup>79</sup>Wilhelm von Döbeln, "Anthropometric Determination of Fat-Free Body Weight," Acta Medica Scandinavica, CLXV, No. 1 (1959), 37-40.

<sup>80</sup>Young and others, 102-107.

<sup>81</sup>Katch and Michael.

<sup>82</sup>D. B. Dill and others, "Body Composition and Aerobic Capacity of Youth of Body Sexes," Medicine and Science in Sports, IV (Winter, 1972), 198-204.

an average of 22 percent body fat. Sloan, Burt, and Blyth<sup>83</sup> found that their fifty healthy college women had an average of 22.4 percent body fat. An average of 24.03 percent body fat on twenty-four women undergraduates was reported by Booth.<sup>84</sup>

Using twenty-five American women as subjects, Chen<sup>85</sup> found that they had an average of 24.8 percent body fat and an average age of 24.4. In another study, Young and Blondin<sup>86</sup> found a mean value of 27.7 percent body fat in ninety-four college women. Kindig<sup>87</sup> studied ninety-nine college women and determined that they had an average of 29.1 percent body fat. Wilmore and Behnke<sup>88</sup> reported that

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<sup>83</sup>Sloan, Burt, and Blyth.

<sup>84</sup>Marilyn Joyce Booth, "Skinfold Measurements as an Estimate of Specific Gravity and of the Percentage of Body Fat" (unpublished Master's thesis, University of Alberta, 1969), p. 30.

<sup>85</sup>K. P. Chen, "Report on Measurement of Total Body Fat in American Women on the Basis of Specific Gravity as an Evaluation of Individual Leanness and Fatness," Journal of the Formosan Medical Association, LII (April, 1953), 271-279.

<sup>86</sup>Charlotte Young and Joan Blondin, "Estimating Body Weight and Fatness of Young Women," Journal of the American Dietetic Association, XLI (November, 1962), 452-455.

<sup>87</sup>L. E. Kindig, "Estimation of Body Fat of College Women from Densitometric and Anthropometric Measurements" (unpublished Doctoral dissertation, Temple University, 1967), p. 37.

<sup>88</sup>Wilmore and Behnke, 273.

their 128 female subjects possessed a mean of 25.73 percent fat as determined by underwater weighing.

Underwater weighing also was used to determine percentages of body fat in thirty-four adolescent females who were members of a weight reduction class at a summer camp. Body fat of four of these girls was reported to be higher than 50 percent.<sup>89</sup>

In summary, these studies seem to cite higher percentages of body fat possessed by the women subjects than what Brožek and Keys deemed desirable. This indicates that the average American woman possesses more body fat than what would be considered ideal.

#### Body Composition Studies on Women

Literature related to body composition studies reveals that daily physical activities and modifications of dietary intake are important factors in developing a sound program of weight reduction for the obese individual. Two main weaknesses of body composition studies for women are that studies are few in number, when compared with the number of men, and most of the studies on women were

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<sup>89</sup>R. F. Goldman, B. Bullen, and C. Seltzer, "Changes in Specific Gravity and Body Fat in Overweight Female Adolescents as a Result of Weight Reduction," Annals of the New York Academy of Sciences, CX (September 26, 1973), 913-917.

conducted on athletes. Studies on obese women are more limited.

The importance of the role of exercise in effecting changes in body composition increasingly has been emphasized and recognized by investigators in several fields, including anthropology, medicine, physiology, and physical education. Harris<sup>90</sup> states that the degree and intensity of physical activity are two of the most important factors influencing body composition, regardless of the individual's age. She adds that the most significant etiological factor in obesity is physical inactivity; obese individuals lose excess fat when they exercise; and that body build and character of an individual may be altered by a sustained program of vigorous physical activity.

Tufts<sup>91</sup> studied fifteen overweight females enrolled in a physical education weight control class. The class program, which met four days a week, consisted of a planned diet of 1,000 calories per day (Diabetic Exchange Diet) and a varied activity program. She concluded that diet and activity are needed in order for obese subjects to lose weight.

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<sup>90</sup>Harris, Involvement in Sport: A Somatopsychic Rationale for Physical Activity, p. 122.

<sup>91</sup>Tufts, "The Effects of Diet and Physical Activity on Selected Measures of College Women."

Parižkova<sup>92</sup> concluded that repeated periods of intensive physical activity gradually increased the lean body weight and lowered the percentage of body fat of youth, adults, and the aged. She found female gymnasts had lower percentages of body fat and greater lean body weights during the training season than after the cessation of training, although their total body weights remained constant. The gymnasts consumed fewer calories during the off-season than during the training period.

Lundegren<sup>93</sup> did a similar study on women varsity basketball and field hockey players. She found significant reductions occurred in fat measures at arm, umbilicus, and thigh sites and in the umbilical girth in twelve field hockey players who had no significant weight losses. In seventeen basketball players, fat measures at arm, iliac, and umbilicus sites and girth at the thighs had significant reductions, yet there were no changes in the subjects' weights.

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<sup>92</sup>Jana Parižkova, "Impact of Age, Diet, and Exercise on Man's Body Composition," International Research in Sport and Physical Education, eds. E. Jokl and E. Simon (Springfield, Illinois: Charles C. Thomas, 1964), pp. 238-253.

<sup>93</sup>Herberta Lundegren, "Changes in Skinfold and Girth Measures of Women Varsity Basketball and Field Hockey Players," Research Quarterly, XXXIX (December, 1969), 1020-1024.



Stefanik and others<sup>94</sup> studied the changes in weight and adipose tissue of twenty-seven freshman physical education and therapy majors over an academic year (September-June). The study ended with four weeks of vigorous camp activities. Twenty-seven other subjects were used for paired comparisons. Weight loss was highly correlated with decreased skinfold measurements at the abdominal and scapular regions, and skinfold thicknesses increased at the flexor site regardless of gain or loss in weight. They observed that, during the vigorous spring session, food intake increased but weight remained constant.

In a study of varying degrees of caloric restriction, Buskirk and others<sup>95</sup> found enforced exercise contributed more to body weight loss when the caloric intake was moderately restricted than when calories were severely restricted. They cited a point of interest concerning subjects who walked on a treadmill and who had lead shot attached to their bodies which made them attain their original weights. The subjects did not increase their energy expenditures above those of their lowered weights.

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<sup>94</sup>Patricia Stefanik and others, "Physical Performance, Skinfold Measurements, Activity Expenditures, and Food Consumption of College Women," Research Quarterly, XXXII (May, 1961), 229-236.

<sup>95</sup>E. R. Buskirk and others, "Energy Balance of Obese Patients During Weight Reduction: Influence of Diet Restriction and Exercise," Annals of the New York Academy of Science, CX (September 26, 1963), 918-940.

The effects of two different physical training programs on the body composition and dietary patterns of ten women tennis players and five women swimmers were studied by Katch, Mitchell, and Jones.<sup>96</sup> The sixteen-week physical training period was designated as moderate for the tennis players and strenuous for the swimmers. Comparisons were made on body weight, body density, subcutaneous skinfold fat, and estimated percentage of body fat. The authors concluded that modifications in body composition did not occur during this study and dietary control was necessary in order for modification to occur.

Kollias and others<sup>97</sup> placed nineteen overweight women, aged eighteen to twenty-two, on a fifteen-week weight reduction program. One group was a diet and exercise group, one a diet group only, and one an exercise group only. The diet and exercise group showed a larger amount of weight loss.

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<sup>96</sup>Frank Katch, Ernest Mitchell, and Evelyn Jones, "Effects of Physical Training on the Body Composition and Diet of Females," Research Quarterly, XL (March, 1969), 99-104.

<sup>97</sup>James Kollias and others, "Cardiorespiratory Response of Young Overweight Women to Ergometry Following Modest Weight Reduction," Archives of Environmental Health, XXVII (August, 1973), 61-64.

Substantiating these findings was Zuti<sup>98</sup> who conducted another study on overweight women. He used as subjects twenty-five adult women, between the ages of twenty-five and forty, who were twenty to forty pounds overweight. Eight subjects were in a diet group whose physical activity was held constant and calorie intake restricted by 500 calories per day. An all-exercise group of nine women increased their physical activity by 500 calories expenditure per day and maintained their calorie intake. The eight women in the combination group reduced their caloric intake 250 calories per day and increased their physical activity by 250 calories per day. Body density was increased in the exercise and diet group and in the exercise group. Zuti found that, when exercise was used in a weight reduction regime, more desirable effects in body composition and fitness occurred than when weight reduction was achieved by just a reduction in calorie intake.

Evans, Ellison, and Capen<sup>99</sup> conducted a study to determine the effects of exercise on weight reduction by

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<sup>98</sup>William Zuti, "The Effects of Exercise and Diet on Body Composition of Adult Women During Weight Reduction" (unpublished Doctoral dissertation, Kent State University, 1972).

<sup>99</sup>Joan Evans, Leo Ellison, and Edward Capen, "The Effects of Exercise on the Reduction of Body Weight," Journal of the Association of Physical and Mental Rehabilitation, XII (April, 1958), 56-59.

experimentation with a group of overweight subjects who participated in a conditioning program and maintained a normal diet. They found weight reduction resulted through exercise alone and without the use of a weight reduction diet provided the person's eating habits remained the same.

Reid<sup>100</sup> used 25 percent body fat to denote overweight. Twenty-one overweight women were in an experimental group who exercised three times a week, thirty-five minutes each period, for fourteen weeks. Sixteen overweight women in a control group were in less strenuous physical education classes or in no physical education class. No restrictions were placed on dietary intake. The author concluded that, when diet was not controlled, a fourteen-week program of circuit training failed to produce an increase in energy expenditure sufficient to alter body weight, girth, body density, or total body fat in overweight university women.

In another study,<sup>101</sup> thirty-two college women were used to measure effects of a ten-week exercise program on the subjects' blood pressure, body fat, maximum oxygen

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<sup>100</sup>Betty Ann Reid, "The Effects of a Conditioning Program on the Body Composition of Overweight University Women" (unpublished Master's thesis, University of Maryland, 1970).

<sup>101</sup>Ruth Johnson, Joseph Mastropaolo, and Marion Wharton, "Exercise, Dietary Intake, and Body Composition," Journal of the American Dietetic Association, LXI (October, 1972), 399-403.

consumption, changes in energy intake, and proportion of energy nutrients. The authors found a significant decrease in skinfold measurements which indicated an increase in estimated body density. The exercise program produced a decrease in body fat and a reduction in energy intake with no significant change in body weight.

Using 30 percent body fat as the criterion for obesity, Moody and others<sup>102</sup> studied body composition changes in twelve normal and twenty-eight obese high school girls. Subjects participated in a fifteen- or a twenty-nine-week physical activity program of walking, jogging, and running for three to three and one-half miles, four times a week. No attempt was made to control the subjects' dietary intake. In the obese group, significant reductions were demonstrated in body weight and relative fat. Increases were observed in body density and lean body weight. Subcutaneous fat, assessed by skinfold thicknesses, decreased markedly, while total body weight did not reduce significantly. The nonobese group showed no change in any of the body parameters other than skinfold thicknesses. The authors concluded that dietary modifications must be a part of any comprehensive weight loss program in order to obtain the degree of weight loss usually sought.

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<sup>102</sup>Dorothy Moody and others, "The Effects of a Jogging Program on the Body Composition of Normal and Obese High School Girls," Medicine and Science in Sports, IV (Winter, 1972), 210-213.

An earlier study by Moody, Kollias, and Buskirk<sup>103</sup> found an average decrease of 32 percent in the mean of twelve skinfold measurements for eleven moderately overweight college-age women. A weight loss of over five pounds per subject was obtained. Total body fat decreased and fat-free body weight increased. Subjects participated in an eight-week program of walking and jogging. A treadmill program, to which subjects were unable to adhere, required expenditure of approximately 500 kilocalories per woman, per day, six days per week. Each subject agreed not to change her diet during the study. Caloric equivalent of body composition energy loss was approximately three times the caloric equivalent of the exercise program. The authors concluded that moderate physical activity only partially is compensated for by an increase in caloric intake.

In summary, it has been demonstrated that physical activity has an effect on the composition of the body, particularly when in conjunction with lowered caloric intake. The task is left to physical educators to make wise choices of activity to help the obese student.

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<sup>103</sup>Moody, Kollias, and Buskirk, "The Effect of a Moderate Exercise Program on the Body Weight and Skinfold Thicknesses on Overweight College Women."

BODY IMAGE, MOVEMENT CONCEPT,  
AND Q-TECHNIQUE

Literature concerned with body image reveals most of the work in the area of human behavior has been conducted by the psychologists, particularly psychotherapists. Relatively few body image studies are related directly to physical education, while movement concept studies, although few in number, seem to be limited to physical education. Because movement is highly dependent upon body image, some researchers in physical education have studied body image and movement in the same studies.

Body Image of Obese Subjects

Theorists have found it necessary to use interchangeably the terms for self-concept and body image. Buchanan<sup>104</sup> divides the body image into two components--the body percept (how we see our bodies) and the body concept (ideas we have about our bodies). He states that the obese have a definite defect in the body percept and the body concept is used as a receptacle for self-hate. When the obese feel self-hate, they complain about feeling fat.

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<sup>104</sup>Joseph R. Buchanan, "Five Year Psychoanalytic Study of Obesity," American Journal of Psychoanalysis XXXIII, No. 1 (1973), 30-41.

In working with obese adolescents, Peckos<sup>105</sup> found certain characteristics common to the young people. They were passive, dependent, lacking in self-confidence, and had distorted body images. Most had strained interpersonal relations between themselves and their parents.

While studying ten obese and ten nonobese adolescents, Hammar and others<sup>106</sup> found significantly lower body image scores for the obese group. This indicated a less positive or more impaired body concept than the nonobese group. Obese girls cited few positive attributes about their bodies. They were more obsessed with their obesity than with their bodies. The authors expressed the difference between the girls' and the boys' body images as reflecting the more negative attitude of society toward the obese female.

Buchanan<sup>107</sup> found, during a five-year study of obesity, that 95 percent of inquiries which came to an obesity clinic were from women. However, Buchanan points out that there are at least as many obese men as women in

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<sup>105</sup>Penelope Peckos, "The Teenage Obesity Problem--Why?", Food and Nutrition News, XLII (December-January, 1970-1971), 1, 4.

<sup>106</sup>Hammar and others, "An Interdisciplinary Study of Adolescent Obesity."

<sup>107</sup>Buchanan, 30-41.



the population at large, but it is the women who regard obesity as a liability.

Of thirty-four obese individuals, Mendelson<sup>108</sup> found that almost half had severely disturbed body images and concepts of themselves along with greatly impaired interpersonal and heterosexual adjustments. In contrast, not one of the forty adult obese individuals studied had the same degree of disturbance in these areas. Therefore, the age of the onset of obesity may contribute to obese individuals' development of poor body images.

A study<sup>109</sup> conducted in Germany confirmed the findings of Mendelson. Of sixty-nine obese women subjects and thirty-nine controls, those who showed definite disturbed body images had become obese before marriage. More obese persons were found in lower classes which were more tolerant of obesity than in the upper classes. Suffering stemmed from diminished social prestige and the particular experiences of each individual's body.

Changes in body weight, fitness, strength, stature, skill and ability can affect body image to a great

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<sup>108</sup>Myer Mendelson, "Psychological Aspects of Obesity," Medical Clinics of North America, XLVIII (September, 1964), 1371-1385.

<sup>109</sup>Jean Mayer and A. Tuchelt-Gallwitz, "A Study on Social Image, Body Image, and the Problem of Psychogenetic Factors in Obesity," Comprehensive Psychiatry, IX (March, 1968), 148-154.

extent.<sup>110</sup> Testing this hypothesis was Rohrbacker<sup>111</sup> who used 204 overweight boys at camp, aged eight to eighteen, in an experimental study of eight weeks' duration. Average weight loss was thirty-three pounds for each subject. To determine if the weight remained off, a follow-up study was conducted at the end of sixteen weeks. Body image and self-concept were measured by scores on a Body Cathexis Test, Self Cathexis Test, and a Homonym Test. Nutrition re-education consisted of a 1200-1400 calorie per day high protein diet. Weight loss during the camp period was not significantly associated with a positive change in body image and self-concept. Weight change following camp, however, was associated in a positive manner with change in body image but not self-concept. Rohrbacker concluded,

It might be inferred changing self concept may not be important to the success of a weight reduction program. Changing body image on the other hand may be crucial to the program's success.

#### Body Image and Movement Concept

Jenkins<sup>112</sup> says the following about the physical education teacher:

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<sup>110</sup>Valerie Hunt, "Movement Behavior: A Model for Action," Quest, Monograph II (April, 1964), 84.

<sup>111</sup>Richard Rohrbacker, "Influence of a Special Camp Program for Obese Boys on Weight Loss, Self-Concept and Body Image," Research Quarterly, XLIV (May, 1973), 150-157.

<sup>112</sup>Gladys Jenkins, "These Are Your Children," Journal of Health, Physical Education, and Recreation XXXVII (November-December, 1966), 37.

The difference between the person who instructs and the person who is a real teacher lies in the ability to recognize the importance of the child's feelings about herself. We are really teaching if each child can leave our group holding the head high with self-respect and feeling like a person of worth.

Harris<sup>113</sup> states that body image with all its implications for movement and motor activity should be of utmost concern for everyone involved in physical activity endeavors. She adds,

Research which relates behavior characteristics to body size, particularly in overweight individuals, leaves reason to suspect obesity has a great deal to do with one's behavior. If physical activity can make a major contribution toward prevention of overweight, then physical activity may influence behavior (self concept, confidence) to an extent yet to be realized. Children who do not have satisfying and varied movement experiences during childhood may develop a distortion of body image which will influence their participation in physical activity the rest of their lives. By the time they get into organized classes of physical education, this distortion is such a part of them they do not find physical activity pleasing and will resort to almost anything to avoid it. Distortion of body image creates bodily insecurity and lessens the desire for physical activities. A program of physical activity could counteract the development of this distortion for many individuals, provided it is planned with this in mind.

Corbin<sup>114</sup> says that play is essential to proper personality development. "Through play and physical activity the child can improve the self image and more accurately define her personal assets and liabilities."

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<sup>113</sup>Harris, Involvement in Sport: A Somatopsychic Rationale for Physical Activity, pp. 140, 135-136, 146-147.

<sup>114</sup>Charles Corbin, Becoming Physically Educated in the Elementary School (Philadelphia: Lea & Febiger, 1969), pp. 26-27.

The one facet of self image in which physical educators are best trained to deal is the physical image. Physical image is the mental image one has of her body during activity and inactivity, plus what one thinks others think.<sup>115</sup>

The most significant contribution physical activity can make to the well-being of an individual possibly may be provided before adolescence when body identity is the strongest for an individual.<sup>116</sup> Positive movement experiences most definitely will help to alter an individual's body image.<sup>117</sup> Persons choose movement experiences compatible to their body images. A poor body image could correspond to a reduction of movement.<sup>118</sup>

According to Schilder,<sup>119</sup> body image is the picture an individual has of her own body which is formed in her mind. He believes a close reciprocal relationship exists

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<sup>115</sup>Wayne Van Huss and others, "Self-Assessment," Physical Activity in Modern Living (Englewood Cliffs: Prentice-Hall, Inc., 1969), p. 10.

<sup>116</sup>Harris, pp. 155, 157.

<sup>117</sup>Statement by Dorothy V. Harris, physical educator, in a personal interview, Atlantic City, New Jersey, March 16, 1975.

<sup>118</sup>Hunt, 84.

<sup>119</sup>Paul Schilder, The Image and Appearance of the Human Body (New York: International Universities Press, Inc., 1950), pp. 11, 45, 52, 64.

between the development of body image and development of motor skill. In order to start movements, body image is necessary. Body image and movement experiences seem to be interdependent, for one comes to know the body through movement. Performance seems to be directed by the image one has of her body and its own segments.

Kreiller's<sup>120</sup> studies indicate that people who seldom engage in movement tend to have more distorted body images than people who move more and who lead relatively active lives. Substantiating this finding was Harris<sup>121</sup> who found that a sense of successful participation in physical activity promoted desirable body images. Those individuals who were secure with their body images were inclined to participate in physical activity throughout their lifetimes.

Read<sup>122</sup> investigated the influence of competitive and noncompetitive programs of physical education on body image and self-concept. As assessed by the Body-Cathexis Scale and the Tennessee Self Concept Scale, those

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<sup>120</sup>Harold Kreiller, "Movement and Aging: A Psychological Approach," Physical Activity and Aging (New York: Karger, Basal, 1970), pp. 109-127.

<sup>121</sup>Dorothy V. Harris, "Physical Activity History and Attitudes of Middle-Aged Men," Medicine and Science in Sports, II (Winter, 1970), 203-208.

<sup>122</sup>Donald A. Read, "The Influence of Competitive and Non-Competitive Programs of Physical Education on Body-Image and Self-Concept" (unpublished Doctoral dissertation, Boston University, 1968).

individuals who were constant winners had significantly higher positive body-image and self-concept scores than those who were constant losers. Boys who were inactive tended to pursue academic endeavors rather than athletic pursuits and possessed high anxiety levels about their bodies. Read had controlled the winning and losing records; therefore, it appears body image may be altered positively through winning records.

Subjects in McBee's<sup>123</sup> study had favorable feelings toward throwing and jumping, and they possessed secure body images. Those expressing negative feelings toward throwing and jumping displayed insecure body images.

Tanner<sup>124</sup> used two elementary schools--one an activity oriented school and the other a basic movement school. Two hundred eleven first- and second-grade students were the subjects. In the school with a regular elementary physical education teacher, she found that the children scored better on body image and movement concept tests.

Possible relationships between body image and physical performance in adolescent girls were explored by

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<sup>123</sup>Dorothy C. McBee, "Self-Conceptualization in Movement" (unpublished Master's thesis, University of California, Los Angeles, 1962).

<sup>124</sup>Patricia Tanner, "The Relationships of Selected Measures of Body Image and Movement Concept to Two Types of Programs of Physical Education in the Primary Grades" (unpublished Doctoral dissertation, Ohio State University, 1969).

Schulz,<sup>125</sup> Physical performance was measured by four items: balance on stick, obstacle race, wall pass, and standing broad jump. Body image was measured with the semantic differential test where the subject rated herself on a seven-point scale consisting of twenty-one bi-polar words and the "Draw a Person Test." She found that a definite relationship did exist between body image and physical performance and that subjects who were poor performers physically tended to score low on body image tests. Subjects who were better performers tended to score high on body image tests.

Samuelson<sup>126</sup> investigated the effects of a specially structured seven-week physical education class upon the self-concepts of low self-esteem held by tenth-grade girls. There were eleven experimental subjects and nine control subjects. From her investigation, the author concluded, "Physical education can serve as a medium in which low self-esteem girls have opportunity to experience degrees of success and feelings of self-worth."

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<sup>125</sup>Louise Elizabeth Schulz, "Relationship Between Body Image and Physical Performance in Adolescent Girls" (unpublished Master's thesis, University of Maryland, Baltimore, 1961).

<sup>126</sup>Genelle Faye Samuelson, "The Effects of a Specially Structured Seven Week Physical Education Class Upon the Self-Concept of Low Self-Esteem Tenth Grade Girls" (unpublished Master's thesis, University of North Carolina, Greensboro, 1969).

Yeatts and Gordon<sup>127</sup> found that the self image of forty-six seventh-grade students who were taught by a physical education specialist correlated positively with physical performance. Twenty-nine subjects who had not worked with a physical education specialist were not as capable of assessing accurately their physical performances on the American Association for Health, Physical Education, and Recreation physical fitness test, nor were their performances as high.

Aspects of movement concept with third-grade subjects was investigated by Beyman.<sup>128</sup> Her study was designed to investigate relationships between movement concept, self-estimates, and motor performance on a specific task. A finding was that, after an individual experienced a task, performance on that task was related to the individual's movement concept.

Using 200 college freshmen women as subjects, Zion<sup>129</sup> studied the relationship between the self-concept and body concept. She concluded,

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<sup>127</sup>Pearline P. Yeatts and Ira J. Gordon, "Effects of Physical Education Taught by a Specialist on Physical Fitness and Self-Image," Research Quarterly, XXXIX (October, 1968), 766-770.

<sup>128</sup>Bertha Beyman, "Movement Concept, Self-Estimation and Performance of a Gross Motor Task" (unpublished Master's thesis, Purdue University, 1969).

<sup>129</sup>Leela C. Zion, "Body Concept as It Relates to Self Concept," Research Quarterly, XXVI (December, 1965), 490-495.



There is a significant linear relationship between self concept and body concept in most dimensions measured. The security one has of her body appears to relate to the security with which one faces one's self and the world.

Throneberry<sup>130</sup> examined the relationship between weight change and selected personality traits and weight change and selected activity programs. Using 172 freshmen college women as subjects, she found weight loss was related to personality gain. Maximum weight loss in any physical education activity class studied was 4.15 pounds for a slimnastics class; and, yet as determined by The Guilford-Zimmerman Temperament Survey, this group experienced a personality change which was significant at the .01 level.

A relationship was found between self-concept, body image, and movement concept in college women of both low and average motor ability. Using Stephenson's<sup>131</sup> Q-sort technique, Doudlah<sup>132</sup> measured three psychological variables. A significant finding was that there were no differences in the relationships being studied except movement concept

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<sup>130</sup>Connie A. Throneberry, "An Investigation of Weight Change as Related to Personality Traits and Activity Programs" (unpublished Master's thesis, California State College, Long Beach, 1968).

<sup>131</sup>William Stephenson, The Study of Behavior: Q-Technique and Its Methodology (Chicago: University of Chicago Press, 1953).

<sup>132</sup>Anna May Doudlah, "The Relationship Between the Self-Concept, the Body-Image, and the Movement-Concept of College Freshmen with Low and Average Motor Ability" (unpublished Master's thesis, University of North Carolina, Greensboro, 1962).

between the low and average group. A more significant relationship was shown in the average group between body image and movement concept. In this study, Doudlah introduced the idea of the movement concept as the way in which one views herself as a physically mobile unit. For this study, she developed three psychological tests: a Q-sort Self Concept Test and a Q-sort Body Image Test which apply discretely to females and a Q-sort Movement Concept Test. The groups of statements developed by Doudlah for the Q-sorts were submitted to a seven-person jury composed of four female physical educators, one male psychiatrist, one male psychologist, and one male sociologist, all from the Women's College of the University of North Carolina. Each jury member rated the 150 statements on the basis of their relevancy of studying body image and movement concept of college women. The statements were evaluated and seventy-five statements for each concept were retained as deemed by the jury.

Doudlah's Q-sort tests have been used by several researchers in physical education. Johnston<sup>133</sup> used her

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<sup>133</sup>Bower Lyttleton Johnston, "A Study of the Relationships Among Self-Concept, Movement Concept, and Physical Fitness, and the Effects of a Physical Conditioning Program and a Sports-Skill Program Upon Self-Concept and Movement Concept" (unpublished Doctoral dissertation, Florida State University, 1969).

movement concept test to investigate the relationships among self-concept, movement concept, and physical fitness. He further determined the effects of a physical conditioning program and a sports-skill program upon self-concept and movement concept. Q-sort tests were given to fifty-three male college students. The relationship between self-concept and movement concept was significant. However, no significant relationships were determined between self-concept and physical fitness and between movement concept and physical fitness.

Tufts,<sup>134</sup> using Doudlah's body image and movement concept tests, studied fifteen overweight college women to determine whether body image concept and movement concept were altered by diet and physical activity. Body image and movement concepts were significantly improved as a result of diet and physical activity.

The relationship between selected measures of physical fitness, self-concept, body image, movement concept, and other personality traits of twelve college physical education women majors with low fitness indices was

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<sup>134</sup>Tufts, "The Effects of Diet and Physical Activity on Selected Measures of College Women."

studied by Stroble.<sup>135</sup> Doudlah's Q-sort statements were used to measure the psychological variables. She found that a thirty-day conditioning program brought about a change in body image but not a change in self-concept and movement concept.

Everhart<sup>136</sup> investigated the self-concept, ideal self-concept, body image, and movement concept of twenty-four college females who were enrolled in a fifteen-week weight reduction program. A normal group, consisting of fourteen college females enrolled in a regular five-week body mechanics class, was used as control subjects. Course content consisted of nutritional guidelines for dieting, behavior modification techniques, and related discussion, along with an exercise program. Subjects met three times a week for seventy-five minute periods. Mean weight loss for the overweight subjects was 7.6 pounds. Doudlah's Q-sorts were used to measure the psychological variables. Self-concept during the experimental period did not change for

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<sup>135</sup>Sharon Stroble, "The Relationship Among Selected Measures of Physical Fitness, Body Image, Self-Concept, Movement-Concept and Selected Personality Traits of College Physical Education Majors with Low Physical Fitness Indices" (unpublished Master's thesis, University of North Carolina, Greensboro, 1964).

<sup>136</sup>Barbara Kay Everhart, "An Investigation of Self Concept, Ideal Self Concept, Body Image, and Movement Concept Among Females in a Weight Reduction Program" (unpublished Master's thesis, Pennsylvania State University, 1974).

the overweight subjects. However, body image and movement concept became more positive by the end of the study. Students who were more successful with weight loss were also compared with the less successful weight losers as to self-concept, body image, and movement concept. Everhart concluded that there was no difference between the successful losers and the less successful losers.

Fifty-five freshmen and sophomore college women enrolled in body mechanics, beginning swimming, and fencing classes were given Doudlah's Q-sort test to measure movement concept before and after five weeks of instruction. These three groups were unequal in their movement concepts at the beginning of the study but were equal at the end. Nation<sup>137</sup> concluded that the swimming group made the greatest change in movement concept and the fencing group showed the next greatest degree of change. There was no significant difference in movement concept scores for subjects enrolled in body mechanics.

Another psychological test, The Tennessee Self Concept Scale, was administered by Lay<sup>138</sup> to a group of

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<sup>137</sup>Edna Earle Nation, "The Effects of Physical Education Instruction Upon Movement Concept" (unpublished Master's thesis, University of North Carolina, Greensboro, 1963).

<sup>138</sup>Nancy Lay, "The Effects of Learning to Swim on the Self-Concept of College Men and Women" (unpublished Doctor dissertation, Florida State University, 1970).

college non-swimmers at the beginning and at the conclusion of a basic swimming course. The experimental group consisted of forty-five women and thirty-three men. This group further was divided into an all-female class, an all-male class and a coeducational class. The control group was composed of forty-eight women and forty-one men. Comparisons of the scores indicated women non-swimmers had slightly higher pre-self-concept ratings than did the female control group. Post-test data revealed self-concept ratings for women controls had decreased slightly, whereas scores of the female swimming group had remained constant. Women in the coeducational class who failed to learn to swim showed a decrease in self-concept. Lay concluded that learning to swim is beneficial to the self-concept of college men and women.

In summary, the foregoing studies revealed that body image concepts, movement concepts, and self-concepts can be enhanced by a program of physical activities designed to meet the physical and psychological needs of the student. The task is left to physical educators to provide students with such a program. Studies which related these concepts to obese individuals who had experienced weight loss were limited.

### Q-technique

Stephenson,<sup>139</sup> the first proponent of Q-technique, devised a method of correlating people instead of variables using statistically acceptable procedures. The method was criticized at its inception, but now is accepted as a legitimate research technique.

Dymond<sup>140</sup> reports test-retest reliabilities of the Q-sort to be as high as .86. Turner and Vanderlippe<sup>141</sup> report Q-sort congruence between the self and the ideal self is greater in college students who are more active in extracurricular activities, have higher scholastic averages, and are given higher sociometric rankings by fellow students.

Strong and Feder<sup>142</sup> say the following about Q-sort technique:

The Q-sort technique consists of sorting various statements on cards under certain given instructions. In this method the individual being described provides

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<sup>139</sup>Stephenson, The Study of Behavior: Q-Technique and Its Methodology.

<sup>140</sup>Rosalind Dymond, "Adjustment Changes Over Therapy from Self-Sorts," Psychotherapy and Personality Change, eds. Carl Rogers and Rosalind Dymond (Chicago: University of Chicago Press, 1954), p. 76.

<sup>141</sup>R. H. Turner and R. H. Vanderlippe, "Self-Ideal Congruence as an Index of Adjustment," Journal of Abnormal Social Psychology, LVII (September, 1958), 202-206.

<sup>142</sup>Donald Strong and Daniel Feder, "Measurement of the Self Concept: A Critique of the Literature," Journal of Consulting Psychology, XXV, No. 2 (1961), 170.

her own frame of reference. The procedure requires the subject to sort a number of self-reference statements (usually 70-150) into a series of piles or classes along a continuum of appropriateness or accuracy of self-description, from those that are "least like" her to those that are "most like" her. The number of items sorted into each pile is specified in such a way the resulting frequency distribution approximates that of a normal distribution.

A discrepancy between the self sort and the concept of the desired or ideal self is viewed as reflecting a sense of self-dissatisfaction or maladjustment.

Eight advantages of the Q-sorting procedures listed by Plummer<sup>143</sup> include:

1. The interpretation of the test items is left to the subject rather than placing a value judgment on the items and imposing this on the subject.
2. A great many discriminations are made.
3. All subjects make the same number of discriminations: comparison between orderings is straightforward, rapid and without ambiguity.
4. Q analysis gives "normative personological" factors, i.e., factors which reflect differences within subjects.
5. Q-sorts insure statistical inter-sorter comparability of data, since all sortings conform to the same distribution and thus have the same mean and standard deviation.
6. The forced choice technique of Q-sorting enables comparison between judges to be made straightforwardly without distortions due to "response sets."
7. Q-sorts can be used as a classificatory device for finding the sub-population in a non-homogeneous population; and for the purpose of quantifying the

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<sup>143</sup>Peter J. Plummer, "A Q-Sort Study of the Achievement Motivation of Selected Athletes" (unpublished Master's thesis, University of Massachusetts, 1969), pp. 15-16.



extent to which an individual may be regarded as belonging to certain species and sub-species.

8. Q-sorts allow for the efficient use of statistical and computational techniques.

#### SUMMARY OF RELATED LITERATURE

The literature revealed that physical educators need to provide meaningful activities through which individuals develop favorable attitudes concerning participation in physical endeavors. Special consideration must be given to students handicapped by obesity.

Inactivity has been shown to be a contributing factor to weight gains by sedentary persons. Throughout the years, as technology has advanced, so has the rate of obesity. Therefore, to prevent creeping obesity, individuals need exercise to expend excessive caloric intake, decrease their caloric consumption, or a combination of these two activities. Herein lies one role for physical educators: to provide meaningful opportunities through which obese persons, or persons desiring to maintain their weights, may expend calories.

Researchers have found that obese individuals who participated in a vigorous exercise program without lowering their caloric intakes usually lost a significant amount of body fat, yet, did not lose a significant amount of body

weight. Therefore, permanent activity and a decrease in caloric consumption seem to be necessary for obese individuals to lose weight and to prevent recurring obesity.

Physical activities have been shown to enhance body images and movement concepts. Q-sort technology has been one method of measuring these two psychological variables. However, research on obese subjects seemed limited. Further research is warranted to provide information on diet and physical activity that will motivate the individual toward the pursuit of a healthier and happier life from a psychological and a physical standpoint.

## Chapter 3

### PROCEDURES

In this study an investigation of body image, movement concept, and body composition was conducted in a weight reduction program for obese college women. Procedures followed during the course of the investigation are presented in four sections: (1) selection of subjects, (2) testing procedures, (3) organization of classes, and (4) statistical analyses.

#### SELECTION OF SUBJECTS

Subjects for this study were thirty-two obese college women who were enrolled in a special class for the spring semester of 1975 in the Department of Health, Physical Education, Recreation, and Safety at Middle Tennessee State University. The subjects' ages ranged from eighteen to forty-two. The mean age was 20.3 years.

Prior to the end of the 1974 fall semester, a letter (see Appendix A) was sent to each instructor who taught a physical education activity class in which were enrolled women students. Instructors were asked to provide a

tentative list of women students enrolled in their classes who appeared to the instructors to be slightly obese or obese. Other pertinent information asked included the physical education class in which the student was enrolled, time, place, and days this class met. Instructors' responses in filling out these lists were poor, and a copy of the original letter was re-sent.

These tentative lists were used by the investigator to locate prospective subjects through their physical education activity classes. Students whose names appeared on the list, or students, upon the investigator's inspection who appeared to meet the criteria for the study, were interviewed and informed of the opportunity to participate in the special class. Students, whose names appeared on the tentative lists, but did not appear obese as judged by the investigator, were not interviewed.

Pertinent information that was given to the subjects during the interviews included: time the special class would meet, days it would meet, hours credit given for the class, a general overview of the class organization, and time which would be needed for the pre-tests and post-tests. Q-sort tests were explained only as "fun type" of card sorting tests. No one asked for a further explanation; therefore, students were considered naive to the exact reason for the Q-sort testing.

The majority of students were contacted during their regular physical education classes. However, some future subjects, after hearing other students talking about the class, contacted the investigator personally and asked to arrange an interview.

During the interviews, it became quite obvious whether the student desired to be in the special class. Two students said that they were presently taking their last required physical education class and never wanted to take another one. Another responded that she would like to be in the special class as it would please her mother. Some obese students were quite hesitant about trying to lose weight as they had records of failure. Students, who could not be in the special class due to conflicts, also were asked if they would agree to be control subjects for the study. Students were not asked to give an answer at the interview as to whether they desired to be in the class. A letter confirming the interview (see Appendix A, follow-up letter) was sent to each prospective student asking her to return the bottom part of the letter with a check of "Yes, I can participate in the class," "No, I can not participate in the class, but I will be glad to be in the pre-tests and post-tests," or "No, I can not participate in any manner." Only one student responded "Yes" she would agree to the pre-tests and post-tests. The hesitation was verbalized to the investigator during the interviews that having their body

composition measurements taken seemed to have been a deciding factor in their decisions not to be in the class or not to be control subjects.

Requirements for becoming a student in the special class were: (1) student possessed a minimum of 30 percent of body weight as fat, (2) student was free from known disease or pregnancy, (3) student agreed to the pre-tests and post-tests, and (4) student could meet at the specified class time. Requirements for becoming a control subject were those listed in numbers 1, 2, and 3 above.

Verification of at least 30 percent of body weight as fat was made by two skinfold measurements, the triceps skinfold and the skinfold superior to the iliac crest. Skinfold calculations were obtained in the manner as described in this chapter under body composition measurements. Skinfold data were calculated by the density formula  $D = 1.0764 - 0.00081 (\text{iliac in mm}) - .00088 (\text{triceps in mm})$ .<sup>1</sup> Body fat was computed by the formula  $F = 100 (4.570/D - 4.142)$ .<sup>2</sup>

Three prospective subjects were tested as to whether they possessed the minimum amount of body weight as fat.

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<sup>1</sup>A. W. Sloan, J. J. Burt, and C. S. Blyth, "Estimation of Body Fat in Young Women," Journal of Applied Physiology, XVII (November, 1962), 967-970.

<sup>2</sup>Josef Brožek and others, "Densitometric Analysis of Body Composition: Revision of Some Quantitative Assumptions," Annals of the New York Academy of Sciences, CX (September, 1963), 113-140.

One student did not meet this requirement and was not permitted to register for the class. Obvious obesity determined that the other students who desired to be in the special class possessed this minimum amount.

Students who met the requirements for becoming subjects were asked to register for a special section of Physical Education 105. A letter (see Appendix A, reminder letter) was sent to the prospective students before the end of fall semester to remind them of the spring class for which to register when they met with their advisors. Only students with prior contact were given class cards during registration. The investigator worked during the registration period. She had a list of the approved students and personally gave class cards to the selected subjects.

Initially, thirty-four students registered for the class. One student was advised to change classes because of a heart condition. Another student stayed in the class but was excluded from the analysis of data as her doctor advised that she probably would be unable to lose weight because of the cortisone medication which she began taking during the course of the semester.

Because an inadequate number of control subjects could be found, the investigator's committee members approved the decision that the obese group would be compared

with another college class on pre-test data in order to ascertain how widely these two groups differed at the beginning of the study. Forty-four women students agreed to take the two Q-sort tests and to be subjects for the body composition measurements. This was conducted one month after the beginning of spring semester. Average age of these students was 19.5 years with a range of eighteen to twenty-three years. All were members in a section of "Man's Food and Nutrition" class taught in the Home Economics Department at Middle Tennessee State University. Fifteen of these students were considered obese because they possessed a minimum of 30 percent body weight as fat. Their majors were Home Economics, Sociology, Early Childhood Education, Pre-Nursing, Dietetics, History, Psychology, Dental Hygiene, and Undecided. Testing procedures were identical for this outside group as for the weight reduction class subjects.

#### TESTING PROCEDURES

Testing procedures pertinent to the study were Q-sorts for body image, Q-sorts for movement, and body composition measurements. Testing procedures were identical for the pre-tests and the post-tests.

#### Q-sort Testing and Administration

Prior to the beginning of the 1975 spring semester classes, subjects met one night in a University cafeteria to



take the Q-sort Body Image Test and the Q-sort Movement Concept Test. The special dining room where they met was secluded and had adequate table top space for sorting the cards. A make-up time for six students who had prior commitments was scheduled one week later.

For the administration of the Q-sorts, subjects were asked to sit at separate tables and not to talk to each other during the sortings. Videotaped instructions (see Appendix B), with models and demonstrations, were provided the group for the pre-test and the post-test.

Sorts were given to the students in chronological order from statement numbered one to statement numbered seventy-five. This pre-test required approximately one hour and fifteen minutes to complete. Later, during the scheduled final examination time, subjects took the Q-sort post-test in an auxiliary gymnasium where tables and chairs had been placed for that specific purpose. The students utilized one hour for the post-test.

After a review of the literature, Q-sort technique was selected as an acceptable device for measuring body image and movement concept. This choice was based on the following factors: (1) Q-sorts are objective; (2) Q-sorts are relatively easy to administer and score; (3) Doudlah's statements for body image and movement concept were developed for college women; and, as cited in Chapter 2,

(4) several researchers in physical education have used these Q-sort statements.

Subjects, following Q-sort procedural methods, sorted a set of statements into a predetermined number of categories. Two identical sets of statements were sorted by each subject to describe herself (the self sort) and how she would like to be (the ideal sort).

For the administration of the Q-sort for Body Image, each statement was printed on a separate Manila colored card and numbered one through seventy-five. The Q-sort cards measured three inches by one and one-half inches.

ILLUSTRATION 1: BODY IMAGE AND MOVEMENT CONCEPT STATEMENTS  
NUMBER ONE

Body Image

1. I am good looking.

Movement Concept

1. I am able to push a heavy object (like a piano) without difficulty.

ILLUSTRATION 2: Q-SORT COLUMN DIRECTIVES ONE AND FIVE

Column 1  
2 cards  
MOST unlike you

Column 5  
17 cards  
IN BETWEEN;  
neither like nor  
unlike you

Column directives, printed on a blue card, specified the number of cards required under each column: columns one and nine each required two cards; columns two and eight each required five cards; columns three and seven each required nine cards; columns four and six each required thirteen cards; and column five required seventeen cards. The distribution of cards thus approximated a normal distribution. Columns on the left side were labeled "least like" and those on the right were labeled "most like." An example of the column arrangement is as follows:

	LEAST LIKE					MOST LIKE			
Column:	1	2	3	4	5	6	7	8	9
Number of statements allowed	(2)	(5)	(9)	(13)	(17)	(13)	(9)	(5)	(2)
									n=75

A white piece of paper was placed on the top of each stack upon which each subject wrote her name and circled self or ideal.

The seventy-five movement concept statements were sorted by the same procedure as for body image. Statements for the two tests may be found in Appendix B, along with Doudlah's permission to use them. Pre-tests were compared with post-tests to determine if significant changes occurred during the semester.

### Body Composition Measurements

After a review of body composition techniques, absolute accuracy in the assessment of percentage of body fat for the purposes of this investigation was considered non-essential. Therefore, the most practical method, anthropometric and skinfold measurements, as recommended by Wilmore and Behnke,<sup>3</sup> was used to determine lean body weight.

For the pre-test, subjects dressed in minimal clothing and reported in a post-absorptive state during their first scheduled class meeting to the human performance laboratory where body composition measurements were taken. Skinfold measurements were taken on the dominant side of each subject's body, using Lange skinfold calipers with a caliper pressure of 10 g/mm<sup>2</sup>. Two circumferences were taken, using an anthropometric steel tape. Skinfold sites were measured by following directions by the National Academy of Sciences<sup>4</sup> which are: (1) skin should be firmly pinched, (2) width of the skinfold should be kept to a minimum at the site, (3) calipers should be placed on the

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<sup>3</sup>Jack H. Wilmore and Albert R. Behnke, "An Anthropometric Estimation of Body Density and Lean Body Weight in Young Women," American Journal of Clinical Nutrition, XXIII (March, 1970), 272.

<sup>4</sup>Josef Brožek and Austin Henshel, "Techniques for Measuring Body Composition," Proceedings of a Conference, Quartermaster Research and Engineering Center (Washington, D.C.: National Academy of Sciences, National Research Center, 1961), pp. 12-14.

skinfold at a minimum distance from the crest of the fold, (4) skinfold calipers should be applied about one centimeter from the finger, and (5) skinfold surfaces should be parallel to each other.

Utilizing directions described by Wilmore and Behnke,<sup>5</sup> two assessments were taken at each site. Whenever the difference between the two independent assessments for any one site exceeded 1 percent of the initial value, a third measurement was taken. An average of the two assessments was accepted as the representative value for each site. If a third measurement was necessary, the average of the two closest measurements was accepted as the representative value.

Weight was taken in minimal clothing, without shoes. A balance scale was used and the nearest 1/4 pound was recorded and converted to kilograms. Height was determined by use of a stadiometer. The subject stood in bare feet with her back and head against a calibrated vertical board. A level arm rack extending from the board was placed on the subject's head. Height was recorded to the nearest 1/4 inch and later converted to centimeters for reporting purposes. All body measurements for the regression equation were reported in metric units.

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<sup>5</sup>Wilmore and Behnke, 268.

The multiple regression equation for lean body weight was  $LBW = 1.661 + 0.668 (\text{wt.}, \text{kg}) - 0.158 (\text{scapula skinfold, mm}) - 0.081 (\text{triceps skinfold, mm}) + 0.555 (\text{neck circumference, cm}) - 0.141 (\text{maximum abdominal circumference, cm})$ . For this equation, Wilmore and Behnke report a reliability of .929 and a standard error of measurement of 1.792.<sup>6</sup>

Sites to be measured were located by following descriptions by Wilmore and Behnke.<sup>7</sup> They were: (1) scapula skinfold--inferior angle of the scapula with the fold running parallel to the axillary border; (2) triceps skinfold--midway between the acromion and olecranon processes on the posterior aspect of the arm, the arm held horizontally, with the fold running parallel to the length of the arm; (3) neck circumference--just inferior to the larynx; and (4) maximum abdominal circumference--maximum girth.

Percentage of body weight that is fat was determined by the formula:<sup>8</sup>

$$\text{Fat Percentage} = \frac{\text{Total Weight} - \text{Lean Body Mass}}{\text{Total Weight}} \times 100.$$

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<sup>6</sup>Wilmore and Behnke, 271.

<sup>7</sup>Jack H. Wilmore and Albert R. Behnke, "An Anthropometric Estimation of Body Density and Lean Body Weight in Young Men," Journal of Applied Physiology, XXVII (July, 1969), 26-27.

<sup>8</sup>Ancel Keys and Josef Brožek, "Body Fat in Adult Man," Physiological Reviews, XXXIII (July, 1953), 280.

## ORGANIZATION OF CLASSES

Subjects met in a special class on Tuesdays and Thursdays from 10:50 a.m. until 11:50 a.m. for thirty class meetings. The main emphasis of this special class was to provide experiences in physical exercise and dietary modification information as a means for motivating weight loss. The instructor's goal was not solely to aid these students for a one-semester dissertation study, but was to educate the students in the principles of a continuing program of weight control and physical fitness which they could utilize for the rest of their lives. The basic instruction program which students in the special class received included: (1) dietary information, (2) psychological support, (3) a fitness program, and (4) basic movement activities.

### Dietary Information

The first dietary information given to the students was a basic diet (see Appendix C). In order to set realistic goals of weight loss, the students used their wrist measurements as a method of determining their ideal weights. This method also may be found in Appendix C.

Dietary food intake was kept by the students during the second week of the semester. Students recorded what had been eaten during each two-hour period of time. These

dietary intake sheets were evaluated by the investigator, and suggestions were made as to how the diets could be improved.

Another dietary intake sheet was kept for a second week during the middle of the semester. These intake sheets were evaluated by dietetic majors from the Department of Home Economics at Middle Tennessee State University. Total daily calories, calcium, iron, vitamin A, ascorbic acid, and protein intakes were tallied. These sheets were returned to the students so they could see where improvements in their diets were needed.

As part of the students' dietary education, two guest speakers were invited to the class. Mrs. Edith Sisco, an employee of a nationally known weight reducing organization and a weight loser of over one hundred pounds, spoke to the class during the fourth week of classes. She showed the class a picture of herself when she weighed 244 pounds and gave helpful hints as to how better to select foods. During the eleventh week of classes, the second speaker, also an employee of the same weight reducing organization, was Miss Sharlena Phillips. She was a former Middle Tennessee State University psychology major who had weighed 325 pounds when she left the University in 1970. Since then, she had lost 193 pounds. Miss Phillips lectured to the class about improving their self-concepts and how not



to let food rule their lives. This speech was tape recorded, and students who missed class on the day of her speech were encouraged to listen to the tape.

Each student was required to weigh herself before class each Tuesday. This weight was recorded by the student upon a weight chart which was one of several information sheets kept in an individual folder for each student.

Students were asked to plan their menus weekly. For those students who desired help, a weekly diet plan was made by the instructor for them. These menus revolved around foods from the basic diet plan which the student should and would eat. Any subsequent weekly menus were planned by the student and given to the instructor to check.

### Psychological Support

The psychological support part of the class was geared towards students in the class helping each other. Tuesday classes were begun by the students revealing what they had done "nice for themselves" over the weekend.

Ways in which obese individuals are discriminated against was a discussion topic. Students were in groups of two to four for role playing of some type of problem faced by obese persons.

An activity toward the end of the semester consisted of informal groups of students engaged in rap sessions.

Five groups were each headed by a student who had lost at least fifteen pounds. The instructor tried to diversify these groups. The chairwoman of each group had to explain how she was able to lose weight. Experiences, special difficulties, and ways of making improvements were shared in these small group discussions.

Improving one's appearance was another area for psychological consideration. Mrs. Nancy Smotherman, a cosmetician, lectured and demonstrated to the class about the proper way to apply make-up.

As students lost multiples of ten pounds during the semester, they were commended in front of the class. This was used as a motivating method for students to strive toward higher goals.

### Fitness Program

The fitness program was designed to develop cardiovascular fitness, develop muscle tone, lower heart rates, and expend calories. Before the students embarked on the activity program, two of the class members, who were junior nursing students, took their blood pressures. With a partner, each student recorded her heart rate and body measurements of bust, waist, abdomen, hips, upper thigh, calf, and upper arm. All measurements were recorded again at mid-semester and at the conclusion of the study. These data were kept in the individuals' folders.

During the second week of classes, students took the Cooper Twelve Minute Run-Walk Test<sup>9</sup> to ascertain their beginning levels of physical fitness. The class regularly met on the concourse of the Middle Tennessee State University indoor track which had a controlled environment of seventy degrees.

At the conclusion of each class meeting, for the first ten weeks, except dates utilized by a guest speaker, students were required to walk or run at least one mile. To walk or to run was dependent upon the individual student's preference and ability. Students who missed this activity were required to schedule a make-up time. Progress for each activity day was recorded on an aerobics chart in the students' folders so students could see whether they were improving. During the last five weeks, students were permitted to elect whether they walked or ran the mile. The instructor assumed that, if activity patterns were not reoriented by the tenth week, making the student be more active than desired might be detrimental to the objective of trying to reorient their life patterns.

Students were asked to buy and to read the book Aerobics for Women.<sup>10</sup> The book was selected as the class

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<sup>9</sup>Mildred Cooper and Kenneth H. Cooper, Aerobics for Women (New York: M. Evans and Co., 1972), p. 52.

<sup>10</sup>Cooper and Cooper.

text because it is written in layman's terminology and the charts in it were needed for future reference. Then, as a means of getting these students active, they were asked to earn a minimum of five aerobic points per week for four weeks. Class activities could be counted toward the aerobic points. Students chose running, walking, stair climbing, swimming, stationary running, stationary cycling, or a combination of these programs. Some students preferred to earn the minimum of five points per week and others elected to earn as many as twenty-four points per week. It was hoped that the aerobics program was continued by the students after the semester's conclusion.

Exercise charts were kept biweekly by the students. They recorded the number of repetitions completed for sixteen exercises. These sixteen exercises (see Appendix C) were designed as either warm-up exercises or as exercises for improving muscle tonus in problem areas of the body.

After the members of the class became knowledgeable concerning the effects of exercise, they decided that one of their class goals would be to try to lower each member's resting heart rate. This was to be facilitated by the aerobics program.

#### Basic Movement Activities

Basic movement activities consisted of rope jumping to music; exercising to music, led by either the instructor or another class member; ball handling skills; novelty

dances of the "Bunny Hop," "Alley Cat," "Patty Cake Polka;" tinkling; and contemporary dancing. Students also formed groups of three or four and made up exercises to a contemporary record of their preference. These exercises then were performed for the other class members.

Mrs. Anne Holland, modern dance teacher at Middle Tennessee State University, lectured and demonstrated exercises for slimming problem areas of the body. Her suggested exercises were used as another method of reenforcing class discussions.

#### STATISTICAL ANALYSES

For scoring the individual Q-sort tests, score sheets were used to record the discrepancy between the number of the "self" and the "ideal" of each statement. This was recorded in the column D of the score sheet. Each score was then squared and recorded in column  $D^2$ . Score sheets may be found in Appendix B. These data were used to report the mean and standard deviation of pre-test and post-test scores. Pre-test data were used for comparison with post-test data to report changes which might have occurred during the semester.

Hypotheses in this study were tested by a dependent t test on the pre-test and post-test data. The University's Honeywell 6000 computer was used for statistical computation of the body composition data.

## Chapter 4

### ANALYSES, FINDINGS, AND DISCUSSION

The purpose of the study was to investigate the body image, movement concept, and body composition of thirty-two obese college women who participated in a weight reduction program. The program was designated as a special physical education course for a duration of fifteen weeks.

#### ANALYSES OF DATA

Analyses of data collected during the study are presented in the following sections: (1) Cooper Twelve Minute Run-Walk Test, (2) students' diets, (3) body image, (4) movement concept, and (5) body composition. Findings and discussion follow.

##### Cooper Twelve Minute Run-Walk Test

Distance covered on the initial Twelve Minute Run-Walk Test ranged from .63 to 1.15 mile with a mean of .87. Distance covered on the final test ranged from .75 to 1.39 mile with a mean of 1.02 mile. At the beginning of the semester, the class was in a fitness category of very poor and at the conclusion of the semester was classified as

poor. Table 1 describes the fitness categories for a woman under thirty years of age.

Table 1

Women's Optional 12-Minute Running Test

Distance (Miles) Walked and Run in 12 Minutes

Fitness Category	Under 30
I. Very Poor	less than .95
II. Poor	.95-1.14
III. Fair	1.15-1.34
IV. Good	1.35-1.64
V. Excellent	1.65 and more

Source: Aerobics for Women by Mildred Cooper and Kenneth H. Cooper, M.D. Copyright © 1972 by Mildred Cooper and Kenneth H. Cooper, M.D. Reprinted by permission of the publisher, M. Evans and Company, Inc., New York, New York 10017, p. 52.

Students' Diets

An analysis by dietetic majors at Middle Tennessee State University of one week's dietary intake of the obese students revealed that these obese students were consuming adequate amounts of protein and ascorbic acid. They were not obtaining the recommended amounts of iron, calcium, and vitamin A. No subject consumed more than ten milligrams of iron on any one day, and every student reported a questionably low caloric intake.

### Body Image

The dependent  $t$  test of significance of differences between means revealed a non-significant difference between the pre-test and post-test scores for body image of the subjects. Table 2 contains these data. Raw data appear in Appendix D.

Table 2  
Comparison of Pre-test and Post-test Measures  
of Body Image and Movement Concept

Variable	Pre-test		Post-test		$t$
	Mean	S.D.	Mean	S.D.	
Body Image	418.56	136.56	402.47	113.29	.966
Movement Concept	366.31	159.21	344.47	148.30	1.380

$t$  of 2.042 needed for .05 level of significance

### Movement Concept

The dependent  $t$  test of significance of differences of the pre-test and post-test scores for movement concept yielded a  $t$  value of 1.380. This value was not statistically significant at the .05 level. These data also may be found in Table 2. See Appendix D for the raw data.

### Body Composition

Differences between pre-test and post-test body composition measures are shown in Table 3. All measurements



changed significantly with the exception of the neck circumference. See Appendix D for the raw data.

Table 3  
Comparison of Pre-test and Post-test  
Regression Equation Measurements

Variable	Pre-test		Post-test		$\underline{t}$
	Mean	S.D.	Mean	S.D.	
Body Weight (kg)	82.15	11.15	76.90	11.85	6.428*
Scapula (mm)	39.06	10.07	27.47	13.17	6.727*
Triceps (mm)	27.42	7.51	23.22	6.93	5.029*
Neck (cm)	34.37	2.03	34.17	2.21	1.083
Abdominal (cm)	108.59	10.78	99.76	11.13	8.261*

\*Significant at the .05 level

Body weight. Although three subjects gained in total body weight, the mean of body weight loss was 5.25 kilograms or 11.71 pounds. The dependent  $\underline{t}$  test of significance between the pre-test and post-test data yielded a  $\underline{t}$  value of 6.428. This value was statistically significant. These data appear in Table 3.

Body fat. One subject gained in percentage of body weight as fat. The remainder lost body fat during the

Table 4  
Comparison of Pre-test and Post-test  
Measures of Body Fat

Variable	Pre-test		Post-test		<u>t</u>
	Mean	S.D.	Mean	S.D.	
Body Fat %	36.64	2.95	32.85	2.84	8.831*

\*Significant at .05 level

course of the study. The dependent t test of significance yielded a t value which was statistically significant.

See Table 4 for the data. Raw data appear in Appendix D.

#### Summary

The Cooper Twelve Minute Run-Walk Test indicated that the obese subjects were in a very poor fitness category at the beginning of the study and that these subjects were in a poor fitness category at the conclusion of the study. The analysis of diet patterns was not remarkable. Differences found in pre-test and post-test body image and movement concept variables were not significant. Differences in pre-test and post-test losses for total body weight and percentage of body weight as fat indicated that the losses were statistically significant.

## FINDINGS

Below are the hypotheses and the acceptance or rejection of each.

Hypothesis 1: There will be a statistically significant change in body image of the special physical education class members. Hypothesis 1 was rejected because the difference in Q-sort body image test scores was not statistically significant.

Hypothesis 2: There will be a statistically significant change in movement concept of the special physical education class members. Hypothesis 2 was rejected because the difference in Q-sort test scores for movement concept was not statistically significant.

Hypothesis 3: There will be a statistically significant change in total body weight of the special physical education class members. Hypothesis 3 was accepted as there was a statistically significant change in total body weight of the subjects.

Hypothesis 4: There will be a statistically significant change in percentage of body weight as fat of the special physical education class members. Hypothesis 4 was accepted as there was a statistically significant change in percentage of body weight as fat of the subjects.

## DISCUSSION

### Comparison of Pre-test Data with Those of Another College Class

Women students enrolled in a home economics class agreed to be subjects for pre-test data comparisons in this study. The mean lean body weight of these forty-four students was 40.74 kilograms with a range of 31.59 to 52.33 kilograms. Their average percentages of body weight as fat was 29.63 percent with a range of 23.29 to 34.94. The mean of the Body Image Test was 263.2 with a range of 70 to 562. Mean of the Movement Concept Test was 276.9 with a range of 55 to 630. A comparison of these data with those of the subjects' within the study indicates that the members of the special physical education class had considerably higher scores on all variables tested. The subjects were larger physically and were more disturbed in their body images and their movement concepts which would seem to indicate that perhaps these students needed special attention in their classes.

### Diets

Students reported their total caloric intakes at such low totals that it was assumed the students tended to underestimate their intakes, did not record everything

eaten, or their intakes purposely were reduced due to the Hawthorne Effect. Students indicated that they had difficulty determining which measures are according to volume and which are according to weight.

Students who complained the most about being unable to stick to their diets were those who ate institutionalized food. At Middle Tennessee State University, all freshmen dormitory students must purchase meal tickets. On some occasions, it was extremely difficult for students to obtain a well balanced meal which was appropriate for a dieter. This finding was substantiated by Young<sup>1</sup> who said that, in the past, when campus housing arrangements included compulsory meal contracts, obese students found it difficult to select a low-calorie diet and were tempted to eat what had been paid for, with frequent weight gain.

At the beginning of the study, five students indicated that they ate breakfast. Getting up late and feeling anorexic were principal reasons given by the remainder for not eating. At the conclusion of the study, only eleven students indicated that they were eating breakfast.

Students seemed uninterested in what nutrients were found in a particular food. They seemed more interested in

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<sup>1</sup>Charlotte M. Young, "Weight Control in a College Situation," Postgraduate Medicine, LI (May, 1972), 118.

knowing if a food which they liked was permissible for them to eat.

### Body Image

Unknown and unseen by the investigator, as the students walked or jogged their mile, they were confronted with jeers which related to their body sizes by male members of another physical education class which met on the opposite side of the indoor track. This was revealed when the class participated in role playing activities. This jeering may or may not have had a detrimental effect upon the subjects' body image scores.

### Movement Concept

Since body image and movement concept are psychological variables, it is conceivable that the time allotted for this study was not enough to bring about a significant change in either of the two.

During the physical activity sessions, it became evident that many of the students did not possess the fundamental skills in which they should have received instruction in elementary and high school. The reason given for this lack of skill acquisition is a supposition that these students were hesitant about being active during their earlier years. Students seemed delighted during the activity sessions when they learned to perform some skill

such as crossing hands during rope jumping--a skill which they had never performed in earlier years.

While performing exercises to music, these obese students seemed quite flexible. Exercises performed to music were accepted more readily by the class than exercises without music. Music also accompanied running.

#### Body Composition

In all probability, the neck musculature was not actively involved in the designated class exercises. Due to the framework of the study, the significant decreases in the other body composition variables may be attributed either to diet, physical activity, or a combination of the two; although diet and physical activity were assumed to complement each other.

#### Fitness Program

Weight and girth measurements were taken quite seriously by the students. During the course of the study, students seemed to be as pleased with body measurement losses as they were with pounds lost. To be able to wear outgrown clothes was a joy. Students indicated during the first few weeks that they might not be losing body weight, but were losing inches. The only exception where there was displeasure with the number of inches lost was in the bust measurement. Students also were pleased with their lowered

heart rates. Blood pressures did not decrease, but at the beginning of the study only one subject had what was considered a high reading, a systolic pressure of 150 and a diastolic pressure of 100.

To jog a continuous mile seemed to be a goal desired by many of the class members. Of the thirty-two students, only twelve were able to accomplish this feat during the course of the study. However, it would have been unrealistic to expect all students in the class to accomplish this activity. Those students who were able to jog a continuous mile reported that they were unable to eat for approximately one and one-half hours after running, felt better the rest of the day, and did not consume as much food on the days they ran.

As students ran, it was obvious that most needed brassieres with more control and support because there was a considerable amount of wasted energy in their breast areas. Students reported that they could not find a good, inexpensive brassiere of contemporary fashion.

#### Psychological Implications

During the initial Cooper Run-Walk Test, it was surprising that the student who weighed more than anyone else in the class, 248 pounds, was the student who covered the greatest distance, 1.15 mile. The same student was also



intent on such a high energy expenditure that, during one class, she fainted after jogging one and one-half miles. Shortly afterwards, this student sustained a knee injury in her dormitory room while trying to perform a back bend and, thereafter, her physical activity program was limited by her physician to a bike riding program.

At the beginning of the semester, students were asked what were their desired weights and how many pounds did they expect to lose during the course. Answers ranged from desires to weigh 110 pounds to 190 pounds or expectations to lose ten to sixty pounds during the semester. From these answers, one can ascertain that some of these students were unrealistic in their expectations, especially since the majority of the class members had lean body weights which exceeded 110 pounds.

Students seemed upset when they became edemic during their menstrual periods and used this excuse for their inabilities to lose weight that particular week. Students who lost enough weight to be satisfied with how they looked seemed to cease losing weight. One student attributed this to having new boy friends interested in her and, therefore, did not need to lose any more weight.

The majority of students indicated that they had become obese during their early teens. Role playing activities by the students revealed that their mothers were

deemed responsible for many of their weight problems. Their mothers had expected them to clean their plates at meals and, yet, the daughters had received condemnation from their mothers for being obese. Deeper parental conflicts seemed to accrue if the mothers had no weight problems. If the mothers were obese, the students indicated that, as the students grew older, they had no desire to look like their mothers. One of the instructor's class objectives was to make the students aware of the fact that as future mothers they should not force their children to eat nor offer food to them as a reward. Some of the class members seemed headed for a lifetime of obesity, but they could control the destiny of their offspring.

Depression, boredom, and school and parental pressures seemed to have prompted the students' eating sprees. One subject had lost twenty-two pounds, but regained eleven and one-half pounds during the week that the post-test body composition measurements were taken because she was emotionally upset about taking final examinations. This subject reported that, on one of these days to keep from eating high calorie foods, she consumed two heads of lettuce, one after the other. From discussing weight problems with the students, the investigator concluded that obesity was a secondary problem and, before the students

could be successful weight losers, they first must rid themselves of their primary problems.

Role playing, chatting in informal groups, and moving to music seemed to be the class activities most enjoyed by the students. Role playing revealed that the students felt they were discriminated against by clothing manufacturers and by department store sales persons.

Procrastination was one of the characteristics of the students. They were going to start their diets the next day or they were contemplating joining a nationally known weight reduction organization in the summer when they had more time to devote to losing weight and to improving their appearances.

Since Middle Tennessee State University does not offer a regularly scheduled weight control class, repeated requests were received from students within the study and numerous friends of theirs for there to be such a special class offered. Several of the class members who still had considerable amounts of weight to lose revealed that they needed the class togetherness to motivate themselves to lose weight. Positive reinforcement from the group seemed to come on Tuesdays' weigh-ins. The subject who lost the greatest amount of weight during the course of the study reported that she needed the Tuesday weigh-ins to motivate herself to keep trying to lose weight. After post-test body

composition data were analyzed, it was ascertained that this particular subject had lost a large amount of lean body weight and, therefore, was restricted by the investigator to a maximum weight loss of two pounds per week.

#### Cultural Implication

The six black students in the class seemed to have a particularly difficult time losing weight. Does the black culture tend to accept obesity more readily than other cultures in the United States?

## Chapter 5

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The discussion which follows presents a summary and the conclusions made from the study. The following sections are: (1) summary, (2) conclusions, and (3) recommendations for further study.

#### SUMMARY

The purpose of this study was to investigate the body image, movement concept, and body composition of thirty-two obese college women who participated in a weight reduction program. The program was designated as a special physical education course for a duration of fifteen weeks.

The study was conducted during the spring semester of 1975 at Middle Tennessee State University. Subjects possessed 30 percent body weight as fat to meet the minimum criterion set to be members of the special class. Included in this course were nutritional guidelines for dieting, group discussions, and an activity program.

Based on the work of Doudlah, Q-sorts were used to measure the two psychological variables, body image and

movement concept. Subjects were administered the two Q-sort tests at the beginning of the semester and at the conclusion. The dependent  $t$  test of significance between means was used for within group analysis.

The Wilmore and Behnke regression equation was used to determine the lean body weights of the subjects at the beginning of the semester and at the conclusion. The five variables in the equation were total body weight, scapula skinfold, triceps skinfold, neck girth, and abdominal girth. Changes in these variables and in percentage of body weight as fat were assessed as to statistical significance. The dependent  $t$  test of significance between means was used for the analysis within the weight reduction group.

Significant changes were not found between body image scores, nor were they found between pre-test and post-test movement concept scores. Significant changes did occur in the triceps and scapula skinfold measurements and abdominal circumference, while no significant change occurred in neck circumference. Total body weight and percentage of body weight as fat were significantly reduced. Mean total body weight loss was 5.25 kilograms or 11.71 pounds. The effects of the diet and physical activity could not be separated due to the framework of the study. Diet and physical activity are believed to complement one another in a weight reduction program.

## CONCLUSIONS

Within the limitations of the study, the data obtained seem to justify the following conclusions:

1. Body image and movement concept did not change significantly as a result of this weight reduction program.
2. Percentage of body weight as fat and total body weight changed significantly as a result of this weight reduction program.
3. Significant reductions occurred for the scapula and triceps skinfold measurements and maximal abdominal girth as a result of this weight reduction program.

## RECOMMENDATIONS

The following recommendations should be considered for future study to better determine the body image, movement concept, and body composition of obese college women in a weight reduction program:

1. Compare body image and movement concept of various body types to determine whether body image and movement concept are related to endomorphic, mesomorphic, and ectomorphic body types.
2. Use only obese subjects to devise a regression equation for determining lean body weight.

3. Duplicate the study using a similar group for controls.
4. Devise an aerobics chart which is graduated according to kilograms of body weight.
5. Study similar groups in which one group has only dietary information, one group has movement activities, and one group has a combination of movement and diet.
6. Revise the Q-sort test statements for body image and movement concept.
7. Duplicate the study using pre-teens, all males, or a coeducational group as subjects.
8. Assess the energy output of the subjects during the exercise program.
9. Conduct a longitudinal study so follow-up investigations can be made on the same subjects.
10. Provide obese students with their separate physical education class where their needs may better be met.
11. Provide on-campus dietary selections of foods appropriate for students with special problems.
12. Duplicate the study using longer periods of time for class meetings.



## APPENDIXES

APPENDIX A

LETTERS

## LETTER TO INSTRUCTORS

November 5, 1974

Dear \_\_\_\_\_,

Since you are currently teaching an activity class in which are enrolled women students, I need your assistance. I am looking for prospective overweight subjects for my dissertation study. If you have any women students who appear to you to be the slightest overweight or are overweight, please fill out the following information about the student and return your list to the DA box. List the student's name, your class title, time it meets, and place it meets. The student does not necessarily have to know why the information about her is needed.

Your assistance is appreciated.

Sincerely,

/s/ Elisabeth Bradley  
Elisabeth Bradley

## FOLLOW-UP LETTER

November 29, 1974

Dear \_\_\_\_\_,

This is a follow-up letter concerning the possibility of your participating in a special class for overweight females during spring semester. If you can participate, you are to sign up for PE 105. This class meets at 10:50 on Tuesdays and Thursdays. The class will count as your physical education requirement and you will receive one credit hour. Return the bottom part of this letter whether or not you can participate to Box 3391, MTSU. Mark the letter "Campus Mail," and no stamp will be required. Drop the letter into the slot at the post office marked "Campus Mail." Please return this within two days.

Sincerely,

/s/ Elisabeth Bradley  
Elisabeth Bradley

cut



cut

Name \_\_\_\_\_

Check one

Yes, I can participate in the class. \_\_\_\_\_

No, I can not participate in the class,  
but I will be glad to be in the pre-  
tests and post-tests. \_\_\_\_\_No, I can not participate in any  
manner. \_\_\_\_\_

Comments:

## REMINDER LETTER

December 12, 1974

Dear \_\_\_\_\_

When registering for your PE 105 class, your name will be on a list at the card bank (where you go to register for the Physical Education class). Give your name to the person working there and make sure your name is checked off.

On January 6th at 8:00 p.m., if at all possible, meet in the new section of the Grill at the University Center. Also, if possible, bring at least one overweight female undergraduate with you who is not in the Weight Control class. This meeting will last approximately one hour and fifteen minutes.

On January 7th, the first day of classes, we will not meet our regular class. Instead, you are to come by the physiology lab, located in the section of Alumni Gymnasium which is between the gym and the swimming pool, any time between the hours of 10:00 a.m. to 12:00. Do not eat breakfast Thursday morning. This is to take measurements on you so your body fat weight may be accurately assessed. This procedure will take about five minutes, and try to dress in short sleeves and no bulky pants.

The class text will be Aerobics for Women which is available in the bookstore for \$1.25.

On January 9th we will meet class on the indoor track. Come dressed in comfortable clothing and tennis shoes.

If you need to call me, my home number is 4339, and my office number is 2194.

Sincerely,

/s/ Elisabeth Bradley  
Elisabeth Bradley

APPENDIX B

Q-SORT MATERIALS

## VIDEOTAPED INSTRUCTIONS FOR THE Q-SORTS

The test you are about to take will in no way affect your grade. It is just to give me a better understanding of how you feel about yourself. It is important that you follow directions as carefully as possible and you be as honest as possible. There are no right or wrong answers. You have before you two stacks of cards. After I have finished these instructions, the first stack is to be sorted according to how you see yourself, today, at this time. The second set is to be sorted according to how you would ideally like to be. The nine blue cards are column cards and range from those statements least like you to those statements most like you. There is a specified number of cards to be placed in each column. Every card must be sorted. An example of the completed sort is this poster. [A poster is shown which has a completed sort upon it.] This is the way to begin. [The nine blue column cards are spread out.] Statement number one reads, "I am good looking." I consider myself average looking so I would place statement number one under the number five blue column card. [Several cards are continued to be sorted without any reference to what they say.] Upon completion of each sort, stack the completed sort in order from column one to column nine. [This is demonstrated.] Write your name on the white piece of paper and circle which self or ideal sort you just completed. Remember, the second time you sort these statements, they are to be sorted according to how you would ideally like to be, such as statement number one, "I am good looking." Since I would like to be better looking, I might sort that statement under column eight or column nine.

You may interpret the meaning of each statement any way you think correct. No questions concerning the meaning of the statements can be answered. When you finish with these two sets, turn them in and get two more stacks out of this box. [A second box is pointed to.] These two stacks will have different statements written upon them, but they will be sorted in a manner similar to the first set. Remember, the first time they are to be sorted according to how you see yourself, today, at this time, and the second time they are to be sorted according to how you would ideally like to be. Are there any questions?

## Q-SORT TESTS

## Body Image Statements

1. I am good looking.
2. I enjoy having my picture taken.
3. I feel uneasy when I sit facing a group.
4. Heels make my legs look better.
5. I usually wear flat heeled shoes.
6. I am particular about the length of my skirts and dresses.
7. I am sophisticated.
8. People notice me when I enter a room.
9. I often notice people staring at me.
10. I enjoy looking at myself in the mirror.
11. Being well dressed is important to me.
12. I can appear sophisticated when I want to.
13. I dislike fat people.
14. I inherited my body build and therefore cannot do much about the way I look.
15. I enjoy being a girl.
16. I am concerned about the shape of my legs.
17. I get upset when my face breaks out.
18. I feel sorry for people who are homely.
19. My complexion has never been a problem.
20. Having a clear complexion is important to me.
21. I feel sorry for the girl who has a skin problem.
22. Physical activity is important to me.
23. My shoulders are broad.
24. I have good posture.
25. I feel most comfortable doing small restricted movements.
26. I am poised.
27. I am muscular.
28. I feel good in the clothes I wear.
29. I often wished I looked like someone else.
30. My physical appearance bothers me.
31. I often think about how I appear to others.
32. I look like an average person.
33. I wish I could wear the kind of clothes other girls wear.
34. I like to wear tight fitting clothes.
35. I wish I could do something about my skin.
36. I am ashamed of my appearance.
37. I have big feet.



38. It is important for me to know I am physically attractive.
39. Weight control is difficult for me.
40. I think a lot about my physical appearance.
41. I am underweight.
42. I have nice teeth.
43. I have skinny arms.
44. I usually weigh more than I think I do.
45. I like to dress up because it gives me a good feeling.
46. My hair has always been a problem to me.
47. My hands are strong.
48. I have thick ankles.
49. I have expressive eyes.
50. My smile is warm and friendly.
51. I am sensitive about my size.
52. I am awkward.
53. I am well proportioned physically.
54. I spend a great deal of time on personal grooming.
55. Comments made in a group about physical appearance usually bother me.
56. I like to be told how I look.
57. I really do not care how I look.
58. I usually wear tight fitting sweaters.
59. I rarely think about my body.
60. I look good in shorts.
61. I feel fat.
62. I am too tall.
63. I have heavy thighs.
64. I look good in a bathing suit.
65. I like to talk about my appearance.
66. People are judged by their physical appearance.
67. I have ugly legs.
68. I have skinny legs.
69. My physical size makes me stand out.
70. I have big hips.
71. I like to learn about my body.
72. I am satisfied with the way I look.
73. I have small muscles.
74. I have big bones.
75. I am physically attractive.

#### Movement Concept Statements

1. I am able to push a heavy object (like a piano) without difficulty.
2. My movements are described as slow.

3. Hanging by my arms is difficult for me.
4. I cannot keep up with the class when we do sit-ups.
5. Fine movements (like typing) are difficult for me.
6. Modern dance scares me.
7. I have difficulty getting my arms and legs to work together when I swim.
8. I like to move to music.
9. I take average size steps when I walk.
10. I have difficulty with balance when standing on one leg.
11. I doubt my ability to make baskets when playing basketball.
12. I feel discouraged about my physical ability.
13. I like to do stretching type exercises.
14. I try to get out of physical activity.
15. I have stiff joints.
16. Physical activity has always been important to me.
17. I feel hopeless when playing a game.
18. I am afraid to swim in deep water.
19. I fatigue easily.
20. I judge my physical performance by the best players in my class.
21. I can move as well as anyone.
22. I feel adequate when playing volleyball.
23. I really do not move well.
24. Sports scare me.
25. I feel confident about being able to learn new physical activities.
26. I feel embarrassed when doing exercises.
27. I am able to do heavy physical work.
28. I prefer doing things with my hands.
29. I like difficult physical tasks.
30. Jumping is no problem for me.
31. Physical fitness is unimportant to me.
32. I learn physical skills easily.
33. I throw a basketball with accuracy.
34. I am able to meet the physical demands of everyday living.
35. I am described as an energetic person.
36. I like to do big sweeping movements.
37. I usually use the handrail when going down the stairs.
38. I have difficulty climbing a rope.
39. I stumble a lot when walking.
40. I have no difficulty carrying a wooden chair.
41. I like to do flowing kinds of movements.
42. I have difficulty with exercises which require me to move my arms and legs at the same time.
43. I like to swim.

44. I have fun playing on a team.
45. I like people who are active.
46. I make strong physical demands on myself.
47. I feel good when I move.
48. I am usually not able to do as well as others on my team.
49. I am physically fit.
50. I am easily discouraged when learning new movements.
51. I have difficulty catching large objects.
52. I can bounce a ball with ease.
53. I am interested in knowing how I perform physically.
54. I am really a good player.
55. I drop things.
56. I have trouble remembering dance steps.
57. I feel awkward when carrying large objects.
58. I perform best when doing small coordinated movements.
59. I like sports when I play against another person.
60. I usually lose at sports.
61. I bowl with ease.
62. Controlling the ball in bowling is not a problem for me.
63. I am a good swimmer.
64. I am afraid of falling.
65. My movements are inhibited.
66. I am average in physical skill.
67. I like to do hard physical work.
68. I like to be active.
69. I frequently bump into things.
70. My movements are brisk and sharp.
71. I have no difficulty keeping time with the music when I dance.
72. I feel helpless when faced with a physical task.
73. I have always been proud of my physical ability.
74. Physical activity bothers me. I would rather do something else.
75. I am well coordinated.

## SCORING SHEET

Name \_\_\_\_\_

Circle one: Body Image

Movement Concept

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STATE OF WISCONSIN / DEPARTMENT OF HEALTH AND SOCIAL  
SERVICES

Division of Mental Hygiene  
Central Wisconsin Colony and Training School  
317 Knutson Drive  
Madison, Wisconsin 53704  
(608) 249-2151

January 10, 1975

Ms. Elisabeth Bradley  
Box 3391  
Middle Tennessee State University  
Murfreesboro, Tennessee 37130

Dear Ms. Bradley:

You have my permission to use the Q-sort statements I developed for assessing body-image and movement concept. It would seem important to include self-concept in your study if your concern is for the total person and his/her "problem."

Sincerely,

/s/ Anna M. Doudlah  
Anna M. Doudlah, Ph.D.  
Research Scientist

AMD/mkc

APPENDIX C  
STUDENT FOLDERS

## BASIC DIET

## DAILY MUSTS

2 glasses skim milk or 1 glass evaporated skim milk or 1 1/2 glasses buttermilk  
 3 fruits (1 must be high in vitamin C)  
 2 slices of bread (enriched white or 100% whole wheat)  
 3 vegetables (preferably dark green or yellow)  
 2 servings of meat, fish, poultry, or meat substitute  
 At least 3 regularly scheduled meals; 5 smaller meals will be better.

## UNLIMITED

club soda  
 mustard  
 salt  
 pepper  
 Worcestershire sauce  
 chives  
 lettuce  
 parsley

unsweetened or sugar substitute sweetened tea or coffee  
 water  
 A-1 sauce  
 celery  
 pimentos  
 radishes

## NO-NO'S

alcoholic beverages  
 bacon or fat back  
 butter  
 cake, cookies, crackers, pies  
 candy  
 catsup  
 coconut  
 corn  
 cream  
 cream cheese  
 fried or battered foods  
 fruit, dried or canned in syrup  
 ice cream, ice milk, or sherbet  
 jam, jelly, or preserves  
 smoked fish  
 smoked meat  
 soda  
 soups

luncheon meats  
 muffins, biscuits  
 non-dairy creamers or toppings  
 nuts  
 olives  
 pancakes, waffles  
 peanut butter  
 pizza  
 popcorn, potato chips, pretzels  
 pork products  
 puddings, custards, fruit flavored gelatin desserts  
 rolls or specialty breads  
 salad dressing  
 sardines  
 sugar  
 syrup

## CHEESE AND EGGS

limit eggs to four a week  
 no more than 4 oz. of hard cheese weekly. Soft cheese may  
 be used daily. Soft cheeses: cottage, pot, farmer,  
 ricotta

Hard cheeses: American, cheddar, Swiss, colby  
 If cheese eaten at breakfast, limit to 1 oz. If eaten at  
 lunch 2 oz.

3 of these vegetables MUST be eaten each day. 4 oz.  
 servings except where specified

asparagus	onions
*green beans	*peas, green
*broccoli	*pumpkin
cabbage	rutabagas
cauliflower	*squash
collard greens	turnips
cucumbers (2)	*brussel sprouts
eggplant	
mushroom	
*mustard or turnip greens	
*peppers (2)	
pickles (2)	
sauerkraut	
*spinich	
*tomatoes (2 or 10 cherry)	
beets	
*carrots	
okra	

\*Denotes more nutritious choice.

## FRUITS (3 per day)

At least 2 of these daily

fruit juice--4 oz. of one high in vitamin C	
cantaloupe--1/2 med.	strawberries--1 cup unsweetened
grapefruit--1/2 med.	tangerine--1 med.
honeydew--2" wedge	tomato juice or mixed vegetable
orange--1 sm.	juice (max. 2 glasses)



1 of these daily if desired

apricots--3 whole  
 blackberries or blueberries--1/2 cup  
 cranberries--1 cup  
 mandarin orange sections--1/2 cup  
 nectarine--1  
 peach--1 med. or 2 halves or 1/2 cup slices  
 pineapple--1/4 fresh med.  
 plums--2 med. or 1 large  
 apple--1 med.  
 pear--1 med.  
 grapes--3/4 cup  
 cherries--1/2 cup unpitted

## CEREAL (not over 2 or 3 times weekly)

1 oz. (no presweetened) Must use milk also at this time.  
 Wheat germ is a good cereal, 1/4 cup is 1 oz.  
 Read the cereal labels. You'll be surprised!!!!!!

FISH, MEAT, POULTRY, OR ALTERNATES (6 oz. serving  
 at dinner, 4 oz. at lunch, or 2 oz. for  
 breakfast). MUST be boiled, baked, or broiled.

At least 5 times a week

seafood	pheasant
chicken	turkey
Cornish hen	veal
rabbit	liver

Limit to 3 times a week

beef	lamb
gizzards (pierce before cooking)	venison

Limit to 1 time a week

dried beans (1 cup serving)	wieners (all beef, pierce before cooking)
ham	
horsemeat	

## AVERAGE BODY WEIGHT CHART

<u>Frame Size</u>	<u>Wrist Measurement</u>
Small Frame	4 5/8" - 5 1/2"
Medium Frame	5 5/8" - 6 1/4"
Large Frame	6 5/16" - 6 13/16"

Small Frame

Height 5'0" to 5'3" - wrist measures up to 5 1/2"  
 Allow 100 pounds for first 5 feet. Add 5 pounds for each inch over 5' for your total weight. If your wrist is 5 5/8", add 5 pounds to the total; if it measures smaller than 5 1/2", subtract 5 pounds from the total.

Medium Frame

Height 5'3" to 5'6" - wrist measures 5 5/8" to 5 3/4"  
 Allow 100 pounds for first 5 feet. Add 5 pounds for each inch over 5 feet for your total weight. If your wrist measures larger than 5 7/8", add 5 pounds; if it measures less than 5 3/4", subtract 5 pounds.

Large Frame

Height 5'6" and over - wrist measures 6" to 7"  
 Allow 105 pounds for first 5 feet. Add 5 pounds for each inch over 5' for your total. If your wrist measures larger than 6 1/2", add 10 pounds; if it measures less than 6", subtract 10 pounds.

Wrist measurement \_\_\_\_\_.

From this chart, your desired weight should be \_\_\_\_\_ pounds.

Source: John Robert Powers and Mary Sue Miller, Secrets of Charm (Philadelphia: John C. Winston Co., 1954), p. 5.

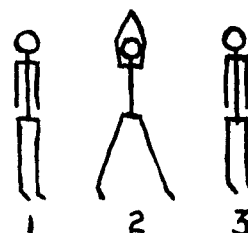
## SUPPLEMENTAL EXERCISES

Directions: As your exercise program will be your choice of how many exercises you need, the maximum number of repetitions is given for each exercise. The first few days, do not try to do the maximum. Gradually work into it. Do the exercises in the following order.

Jumping Jacks--for general conditioning; warm up; maximum 30

Stand erect, feet together, arms at the side. Jump and throw feet out at the sides and at the same time circle arms out and up, clapping hands once overhead. Bring arms back down to side and feet together.

Count: 1 after each return to starting position.

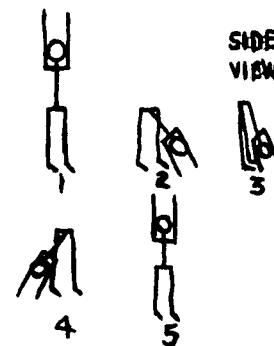


Toe Touching--for stretching back of legs; flexibility; maximum 20

Stand erect, feet about 16 inches apart, arms overhead. Bend down in the direction of outside the left foot. Straighten.

Bob up and down between feet. Bob again in the same direction of outside the right foot. Return to starting position.

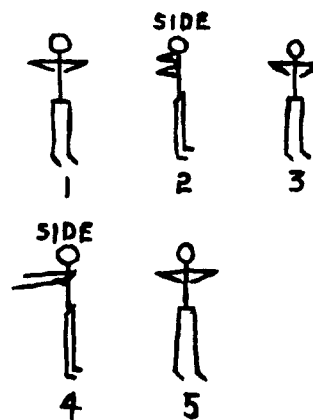
Count: 1 after return to starting position.



Arm Flings--for firming shoulder area; flexibility; maximum 20

Stand erect, feet 12 inches apart, upper arms extended sideways at shoulder level, elbows bent, outstretched fingers touching in front of chest. Press elbows backward. Repeat. Do not let elbows drop. Return arms to starting position and then fling hands and arms outward and backward as far as possible. Return to starting position.

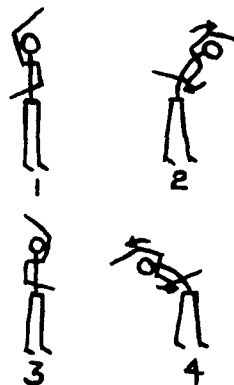
Count: 1 after return to starting position.



## SUPPLEMENTAL EXERCISES--Continued

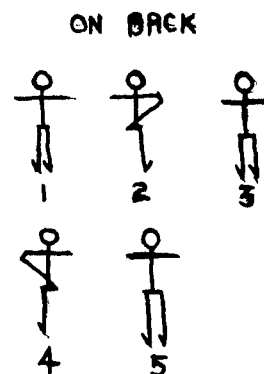
Side Bending--for firming sides;  
flexibility; maximum 20

Stand erect, feet 12 inches apart, right arm extended overhead, bent at elbow. Left arm in front of body with palm pushing right. Keep back straight, bend sideways from waist to left. Bob up a few degrees and press to left again. Return to starting position and change arm positions. Repeat to right.  
Count: Bends to left and right count one.



Leg Overs--for firming waist, hips, and sides;  
flexibility; maximum 20

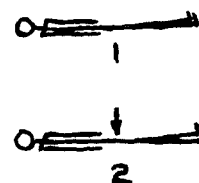
Lie on back, legs straight and together, arms stretched sideways at shoulder level, palms down. Raise right leg until perpendicular to floor, keep leg straight. Lower leg to left, trying to touch left hand with toes. Raise to perpendicular and lower. Repeat with left leg.  
Count: 1 after raising both legs.



Abdominal Contractions--for firming abdomen;  
tonus; maximum 6

Lie on back, legs straight and together, arms relaxed. Contract lower abdominal muscles as hard as possible. Hold 6 seconds. Relax 1 second. Repeat 5 times.

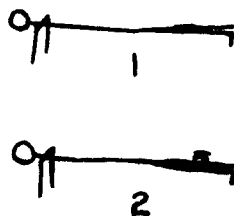
Count: 1 after each 7 seconds.  
DO THIS ONE EVERY DAY.



Thigh Contractions--for firming thighs;  
tonus; maximum 6

Assume push-up position except toes touch floor instead of knees. Contract thigh muscles as hard as possible. Hold 6 seconds. Relax 1 second. Repeat 5 times.

Count: 1 after each 7 seconds.



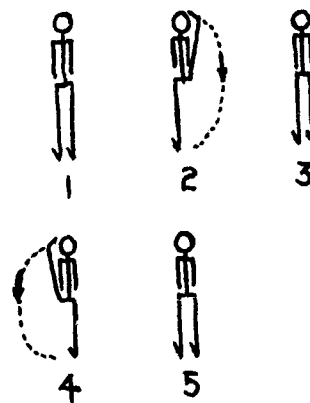
## SUPPLEMENTAL EXERCISES--Continued

Leg Circles--for firming thighs and abdomen;

tonus; maximum 10

Lie on back, legs straight and together, toes pointed, arms straight at sides. Slowly lift leg until perpendicular with body. Circle leg slowly outward until it comes to starting position. Repeat with right leg.

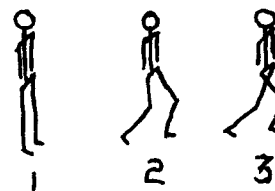
Count: 1 after circle with both legs.

Lunge--for firming thighs;

tonus; maximum 20

Stand erect. Step out with left foot. Half squat. Repeat with right leg.

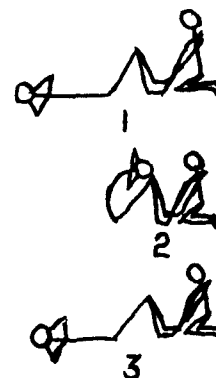
Count: 1 after lunging with both legs.

Sit-ups--for abdominal strength;

tonus; maximum 50

Lie on back, legs bent and together. Hands either behind head, across chest, or overhead. (Partner may hold feet.) Move to sitting position. Keep feet on floor and back straight. Lower body to starting position. (Winged sit-up: touch elbow to opposite knee and return to starting position, alternate; both sides count 1.)

Count: 1 after each return to starting position.

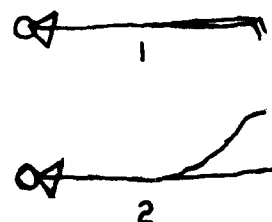
Prone Leg Raises--for firming back of legs and hips;

tonus; maximum 20

Lie on stomach. Legs straight and together, hands under head. Raise left leg from floor as high as possible. Keep leg straight. Return to starting position. Raise right leg. (For added difficulty, have partner slightly hold legs down.)

Count: 1 after each leg raised.

ON STOMACH

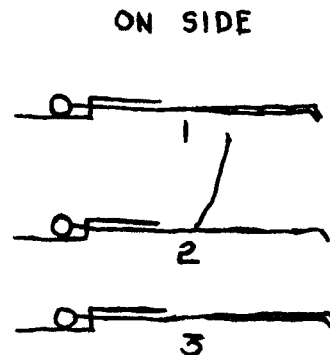


## SUPPLEMENTAL EXERCISES--Continued

Side Leg Raises--for firming sides and outside of thighs;  
tonus; maximum 10

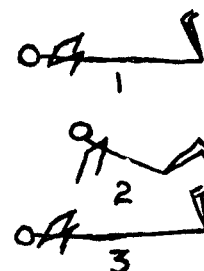
With right side to floor, support weight on right arm, use left hand for assistance with balance if necessary. Raise leg until perpendicular with floor. Lower leg to starting position. Repeat 9 times.

Count: 1 for each side.



Push-ups--for firming shoulders and arms;  
tonus; maximum 30

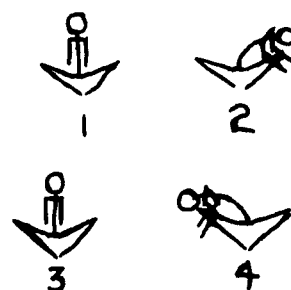
Lie face down, knees bent, and hands directly under shoulders. Push up from hands and knees until arms fully extended. Keep back and legs straight. Touch nose or chin to floor and repeat. Count: 1 each time arms fully extended.



Hip Stretcher--for firming hips, inner thighs, and back;  
tonus; maximum 20

Sit on floor. Knees, bent with soles of feet together. Stretch arms over left knee. Bob 5 times. Repeat in direction of right knee.

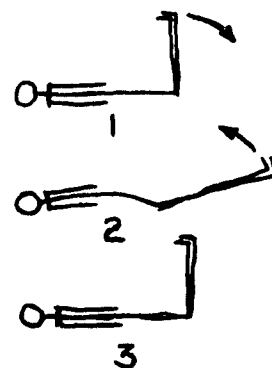
Count: 1 after bob to left and right.



Leg Lowering--for strengthening abdomen;  
tonus; maximum 20

Assume supine position. Straighten legs extending them toward the ceiling. Lower slowly. Stop when back begins to arch. Return legs to starting position. (To make abdominals work harder, hold at a low point for a few seconds but do not let lower back arch.)

Count: 1 after legs return to starting position.



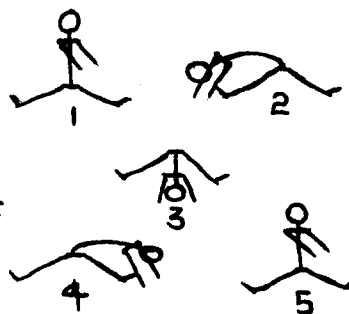
## SUPPLEMENTAL EXERCISES--Continued

Sitting Windmill--for firming waistline  
and back of legs;

tonus and flexibility; maximum 20

Sit with legs extended and apart;  
trunk straight, arms extended at  
shoulder level. Bend as far as  
possible to right side. Repeat to center  
and to left side.

Count: 1 after bending right, center,  
and left.



Finish exercises with 20 more jumping jacks.

APPENDIX D

RAW DATA



Table 5

Weight Measurements and Total Weight Loss at  
the Beginning and at the Conclusion  
of the Weight Reduction Program

Subject Number	Beginning Weight	Final Weight	Total Pounds Loss*
1	147.75	133.50	14.25
2	180.25	187.00	+6.75
3	139.00	127.75	11.25
4	180.00	177.50	2.50
5	183.25	177.00	6.25
6	189.00	187.50	1.50
7	154.00	146.50	7.50
8	159.50	142.25	17.25
9	174.00	164.75	9.50
10	183.75	174.25	9.50
11	217.50	219.00	+1.50
12	188.50	179.50	9.00
13	167.50	146.00	21.50
14	243.00	233.30	9.50
15	197.00	179.00	18.00
16	198.00	193.00	5.00
17	164.50	155.50	9.00
18	200.50	167.75	32.75
19	168.50	150.75	17.75
20	227.50	212.25	15.25
21	156.75	140.00	16.75
22	152.25	149.00	3.25
23	169.00	167.25	1.75
24	163.00	147.00	16.00

Table 5--Continued

Subject Number	Beginning Weight	Final Weight	Total Pounds Loss*
25	213.50	203.25	10.25
26	226.00	210.00	16.00
27	149.60	145.50	4.00
28	184.25	186.25	+2.00
29	177.75	167.00	10.75
30	171.00	154.00	17.00
31	191.50	147.00	44.50
32	178.00	160.75	17.25

\*Weight gain is preceded by a positive sign (+).

Mean weight loss = 11.71 pounds.

Table 6  
Q-sorts for Body Image and Movement  
Concept Comparing Pre-test Scores  
with Post-test Scores

Subject Number	Body Image	Movement Concept	Subject Number	Body Image	Movement Concept
1	381 300	288 495	15	397 244	257 156
2	471 614	280 368	16	184 231	72 190
3	243 386	226 210	17	434 365	132 147
4	457 460	310 266	18	783 488	602 498
5	442 404	106 176	19	282 308	310 252
6	359 338	213 302	20	386 321	324 344
7	331 454	312 304	21	422 459	331 318
8	383 252	613 620	22	318 371	528 357
9	470 444	571 526	23	406 376	493 370
10	541 574	444 230	24	500 396	565 508
11	394 397	458 354	25	161 328	241 158
12	467 246	723 582	26	516 342	458 588
13	443 450	329 174	27	439 390	448 429
14	531 564	297 263	28	203 474	386 423

Table 6--Continued

Subject Number	Body Image	Movement Concept	Subject Number	Body Image	Movement Concept
29	690	408	31	659	530
	559	144		698	588
30	406	313	32	295	154
	361	448		285	235

Table 7

Body Composition Measurements at the Beginning  
of the Course and at the Conclusion  
of the Fifteen-week Period

Subject Number	Weight (kg)	Scapula (mm)	Triceps (mm)	Neck (cm)	Abdominal (cm)
1	67.019	31.5	32	32.1	96
	60.556	19	22	30.7	90
2	81.761	46	37.5	35.9	112
	84.823	48	38	37.7	108
3	63.050	28	21	31.8	98
	57.947	15	14	30.8	87.5
4	81.648	46	16	36.7	101
	80.514	35	14	37.7	92
5	83.122	25.5	27	35.3	103
	80.287	34	24	34.3	93
6	85.730	41	23	34.6	115
	85.050	28	26	35.6	100
7	69.854	28	25	32.7	103
	66.452	21	23	32.8	100
8	72.349	42	25	32.2	95
	64.525	25	20	32.4	91
9	78.926	46	30	32.4	104.5
	74.731	35	22	33.1	103.75
10	83.349	33	25	31.3	115
	79.040	31	27	31.5	110
11	98.658	45	34	34.8	124
	99.338	43	30	35.7	122.5
12	85.504	41.5	36	34.3	108
	81.421	28	30	34.3	92
13	75.978	32	30	33.5	108.5
	66.226	17	17	32.7	90

Table 7--Continued

Subject Number	Weight (kg)	Scapula (mm)	Triceps (mm)	Neck (cm)	Abdominal (cm)
14	110.225	34	31	37.7	132
	105.916	34	20	38.4	124.5
15	89.359	34	26	33.8	99
	81.194	27	27	33.2	90.75
16	89.813	48	19	36.9	117
	87.545	36	18	37	111
17	74.504	25	20.5	32.6	104
	70.535	24	17	33.3	98.5
18	90.947	51	33	37	124
	76.091	33	24	35	107
19	76.432	37	32.5	34	111
	65.667	29	25	34.5	106
20	103.194	51.5	39	37.4	111.5
	96.277	29	30	36.1	106
21	71.102	44	21	32	105
	63.504	26	14	31.2	84.75
22	69.061	33	22	34.2	97.5
	67.586	28	14	34	92.5
23	76.658	41	12	37.8	102
	75.865	37	19	36.6	92.5
24	73.937	35	19	34.2	103
	66.679	17	11	33	97.5
25	96.845	53	25	35.1	126
	92.194	38	27	34.25	122
26	102.514	67	50	38.6	132.5
	95.256	47	41	38.2	121.75
27	67.813	24	26	30.8	86
	65.999	27	25	31.7	86.75

Table 7--Continued

Subject Number	Weight (kg)	Scapula (mm)	Triceps (mm)	Neck (cm)	Abdominal (cm)
28	83.576	27	24	34.7	98.2
	84.483	30	25	35.9	98.5
29	80.627	38	35	33	111
	75.751	25	35	33.4	98.25
30	77.566	43	22	34.7	111.3
	69.854	23	18	34.7	100
31	86.864	25.5	27.5	34.5	105
	66.679	19	22	30.9	87.75
32	80.741	53.5	31.5	33.3	116
	72.916	32	24	32.8	98

Table 8  
 Characteristics of Subjects

Subject Number	Age	Height (cm)	LBW (kg)		% Fat		% Fat Loss*
			Pre	Post	Pre	Post	
1	26	158.12	43.140	41.677	35.63	31.18	4.45
2	18	156.21	50.104	53.356	38.72	37.10	1.62
3	21	162.56	41.484	41.622	34.20	28.17	6.03
4	18	161.29	53.765	56.732	34.15	29.54	4.61
5	18	168.28	56.039	53.900	32.58	32.87	+ .29
6	19	170.18	53.576	57.602	37.51	32.27	5.24
7	18	166.37	45.500	44.974	34.86	32.32	2.54
8	20	160.02	45.805	44.345	36.69	31.28	5.41
9	18	161.93	47.933	48.004	39.27	35.76	3.51
10	25	165.74	51.256	49.347	38.50	37.57	.93
11	20	171.45	59.531	61.336	39.66	38.26	1.40
12	19	171.45	53.113	55.261	37.88	32.13	5.72
13	18	167.64	48.222	47.295	36.53	28.58	7.97
14	18	170.51	69.720	69.178	36.75	34.69	2.06
15	20	173.99	58.675	55.076	34.34	32.17	1.17
16	19	171.45	56.516	57.879	37.07	33.89	3.18
17	21	172.09	49.248	48.202	33.90	31.66	2.24
18	19	157.48	54.734	46.670	39.82	34.72	5.10
19	42	159.39	47.458	44.743	37.91	31.86	6.05
20	21	185.42	64.334	64.052	37.66	33.47	4.19
21	20	170.18	43.459	44.206	38.88	30.39	8.49
22	19	161.25	46.031	47.078	33.35	30.34	3.01
23	18	165.74	52.016	52.224	32.15	31.16	.99
24	19	160.02	48.440	47.193	34.48	29.22	5.26
25	20	167.01	57.669	56.890	40.45	38.29	2.16
26	20	163.83	58.231	58.572	43.20	38.51	4.69
27	18	167.64	46.030	44.819	32.12	32.09	.03



Table 8--Continued

Subject Number	Age	Height (cm)	LBW (kg)		% Fat		% Fat Loss*
			Pre	Post	Pre	Post	
28	18	176.53	56.692	57.367	32.17	32.10	.07
29	24	163.20	49.345	50.161	38.80	33.78	5.02
30	20	170.18	48.464	48.390	37.52	30.72	6.79
31	19	163.83	57.774	46.195	33.49	30.72	2.77
32	19	158.75	46.717	47.755	42.14	34.51	7.63

\*Percent fat gain is preceded by a positive sign (+).

Mean percent fat loss = 3.75

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