AN ABSTRACT OF THE THESIS OF

Shu-Mei Lai for the degree of Doctor of Philosophy in Education presented on December 6, 1983

Title:

A Comparison of Body Composition, Body Cathexis, and Attitude Toward Obesity in Women with Different Levels of Physical Activity

Abstract approved: Redacted for privacy

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The purpose of this study was to identify significant differences in body composition, body cathexis, and attitudes toward obesity of women in various age groups involved in different levels of physical exercise.

A total of 216 women, ranging in age from 17 to 64, took part in this study. They were classified into three age groups: college-age, beyond college-age, and middle-aged, then further divided into three exercise categories: very active, moderately active, and relatively inactive.

All subjects completed the Physical Activity and Body Cathexis Survey. Then the subjects submitted themselves to a series of skinfold fat measurement. In determining the subjects' feelings toward their bodies, the Secord and Jourard's Body Cathexis Scale (1953) was

utilized to collect the data. Bray's Obesity Attitude Scale (1973) was employed to investigate the subjects' attitudes toward obesity. The prediction equation developed by Jackson et al. (1980) was used to determine the subjects' body density. The measurements were taken at triceps, thigh, and suprailium skinfolds. The percentage of body fat was derived from the formula of Siri's (1961).

The results indicated that the middle-aged women had a higher percentage of body fat and lower amount of lean body mass than the beyond college-age women. There was, however, no significant difference between the body composition of the college-age and the beyond college-age women.

Different levels of physical activity performed by women had significant effects on their body fat percentage and their body cathexis. Subjects in the very active level of physical exercise showed the lowest percentage of body fat and the most positive attitudes toward their bodies.

Attitudes toward obesity between women, young or old, exercising or not exercising, were not significantly different. Women's obesity attitudes were not affected by either age or levels of physical activity.

A COMPARISON OF BODY COMPOSITION, BODY CATHEXIS, AND ATTITUDE TOWARD OBESITY IN WOMEN WITH DIFFERENT LEVELS OF PHYSICAL ACTIVITY

by

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A THESIS

Submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Doctor of Philosophy

Completed December 6, 1983

Commencement June 1984

APPROVED:

Redacted for privacy

Professor of Physical Education in charge of major

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Date thesis is presented December 6, 1983

Typed by Mary Ann (Sadie) Airth for Shu-Mei Lai

ACKNOWLEDGEMENT

I wish to express my sincere appreciation to my major advisor, Dr. Arnold W. Flath, for his encouragement and guidance throughout my graduate work at Oregon State University.

My appreciation also goes to the members of my graduate committee--Dr. Carvel Wood, Dr. Wayne Courtney, Dr. Clara Pratt, and Dr. Stephen Hawkes for their many helpful suggestions and critical appraisals of the thesis. A special thanks goes to Dr. Marie Boarman. Her friendship, ready desire to help, and to review the manuscript of this thesis were an invaluable help. Special thanks also extended to Dr. Charlotte Lambert and Dr. John Dunn for their encouragement, support, and particularly, the offering of the Teaching Assistantship, which enabled me to complete my degree.

Finally, I wish to extend my gratitude toward two important people. Their constant support sustained me throughout this research. A very special thank you goes to my husband, Pao-Yin, who has always encouraged and supported me in reaching my educational goals. Special thanks also goes to my daughter, E. E. who was very patient while I studied in the library and worked on this dissertation.

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CHAPTER I

INTRODUCTION TO THE STUDY

In recent years, the public has shown increasing interest in the maintenance and/or improvement of individual physical fitness through physical exercise. There has been great overall increase in the number of people who exercise regularly (Thomas et al., 1981). In 1977, Gallup pollsters estimated that 47% of adults aged 18 and older participated in some form of exercise daily, nearly twice the 24% reported in a poll conducted in 1961. In 1978, the Pacific Mutual Insurance Company commissioned another comprehensive survey on exercise by the Harris Polling Organization; this survey found that 37% of American adults were involved in regular exercise programs. Women were found to be joining the exercise ranks in ever-increasing numbers. It was reported by Snyder and Spreitzer (1983) that one out of every five women polled in 1980 claimed that she was an active participant in some form of exercise; about 42% of the women claimed to be moderately active, while only 38% said they were not very active at all.

Exercise results not only in many beneficial physiological changes, but in improvements in certain psychological parameters as

well. Among those benefits, the changes in both body composition and body image have drawn the attention of many researchers.

The role of exercise training in affecting body composition has been investigated with various populations. The degree or intensity of the exercise is of major importance in regulating the body's fat content and lean muscle mass. During a period of spontaneous physical activity, the individual's lean body mass markedly increases, at the expense of fat. With substantial reduction of muscular activity, the lean body mass decreases and fat content accumulates (Parizkova, 1963). Similar dynamic fluctuations in body fat and lean body mass with variations in physical activity have been observed in men and women of different age groups.

Psychological benefits resulting from exercise participation have also been investigated. Exercise is associated with a feeling of well being; that is, there is a reciprocal relationship between development of physical fitness and development of psychological well being. Moreover, those individuals who maintain a higher level of fitness tend to have more positive attitudes toward their bodies than those who do not exercise regularly. Many of these measurable psychological changes can be attributed to an improved self-image which, in turn, is related to a more positive body image (Ismail, 1973).

This sense of well-being and improved body image appears to be the major reasons for some individuals to participate in exercise programs. Examining the Harris poll data in a different light,

Thomas (1981) reported that 41% of those polled indicated that they exercised to lose weight, while 45% exercised to stay healthy. The most important reason for exercising was the desire to feel better.

Apparently, excess body weight has been the major concern for some people. One of the consequences of the sedentary lifestyle practiced by many people in contemporary society is obesity. Additionally, there is increasing evidence that lack of exercise contributes to the development and maintenance of obesity in some individuals. Since obesity has become a serious health problem research directed at investigating an individual's attitudes toward obesity -- and whether those attitudes are affected by participation or non-participation in an exercise program--would seem to be worthwhile.

The present study was conducted to determine whether there existed any significant differences in body composition, body image, and attitudes toward obesity as a result of a woman's exercise participation. The subjects' exercise levels were established by a self-reported habitual physical exercise questionnaire rather than by prescribing or monitoring a specific training program. This project was undertaken with the assumption that many adults were engaged in self-directed, self-motivated exercise programs--according to personal interest and the choice available to them. Whether the differences between frequent exercisers and non-exercisers showed similar trend as those found in other empirical studies is unknown. Research concerned with the physiological and psychological benefits

associated with habitual physical activity needs to be substantiated further.

The following research questions guided the present investigation:

1. To what extent does habitual physical activity contribute to variations in body composition, body cathexis, and attitudes toward obesity?
2. Do the levels of habitual physical activity have any impact upon
   a. percentage of body fat and lean body mass?
   b. feelings toward conceptual parts of the body?
   c. attitude toward obesity?

Additionally, there is some evidence that age plays a significant role in the variation of percentage of body fat and lean body mass. A question was then raised as to how young and middle-aged women compare in relation to body composition. Are middle-aged female exercisers as lean as their younger counterparts, or do the basic physiological differences dictate a greater amount of body fat in the older women? Thus, the third question for this study was:

3. To what extent does a woman's age contribute to variations in body composition, body cathexis, and attitudes toward obesity?

Purpose of the Study

The purpose of this study was to compare the body composition,

body cathexis, and attitude toward obesity in women with different levels of exercise participation. Specifically, the study was designed to determine whether significant differences in body composition, body cathexis, and attitudes toward obesity exist among college-age, beyond college-age, and middle-aged women whose exercise levels were classified as very active, moderately active, and relatively inactive.

Hypotheses

The results of the study were analyzed to determine if the following null hypotheses should be retained or rejected:

1. There is no significant difference among college-age women, beyond college-age women, and middle-aged women in their percentage of body fat, lean body mass, body cathexis, and attitudes toward obesity.
2. There is no significant difference among very active women, moderately active women, and relatively inactive women in their percentage of body fat, lean body mass, body cathexis, and attitudes toward obesity.
3. There is no significant interaction effect of age and exercise level in women's percentage of body fat, lean body mass, body cathexis, and attitudes toward obesity.

Assumptions of the Study

The following assumptions were recognized in this study.

1. The physical activity history questionnaire accurately classified the subject's physical activity level into one of three defined exercise categories.
2. The scales accurately reflected the subject's feelings toward her body and her attitudes toward obesity.
3. Equations selected for obtaining body composition data accurately predicted the subject's percentage of body fat and lean body mass.

Definitions of Terms

The following meanings were applied to the terms used in this study.

Body composition was defined as the proportional relationship of fatty tissue to lean body weight.

Percentage of body fat (%F) was defined as the ratio of fat weight to total body weight presented as a percentage. In this study, percentage of body fat (%F) was calculated from the formula of Siri (1961) in which %F = 4.95/BD + 4.5. Body density (BD) was obtained according to the equation of Jackson et al. (1980).

Lean body Mass (LBM) referred to all body tissue (bone, muscle, etc.) excluding fatty tissue. In this study, the lean body mass (LBM) was obtained by subtracting fat weight from total body weight. Thus, LBM = body weight - (body weight x %F).

Attitude was defined as a complex but relatively stable behavioral disposition reflecting both degree and direction of feeling toward a

particular psychological object, whether it be concrete or abstract (Kenyon, 1968).

Obesity referred to a bodily condition marked by excessive generalized deposition and storage of fat (Webster, 1981). In this study, attitude toward obesity was measured by Bray's obesity attitude scale (1973).

Body Cathexis was defined as the strength and direction of feelings toward various functions or parts of the body (Secord & Jourard, 1953).

Physical exercise or physical activity was defined as those physical activites dedicated primarily to the maintenance or improvement of one's health and physical fitness. It involved gross motor movement, usually manifested in active aerobic exercises, games, sports, calisthenics, weight lifting, and dance.

CHAPTER II

REVIEW OF RELATED LITERATURE

The purpose of this review of the literature is threefold: (1) to delineate the present state of knowledge concerning body composition, body image, and obesity; (2) to provide theoretically relevant and/or empirically verified factors, specifically age and exercise, and their association with body fatness, body image, and obesity; and (3) to illustrate the criterion instruments employed in this study. The review is divided into three major sections: studies on body composition, studies on body cathexis, and studies on attitude toward obesity. Each section provides a basis for categorizing studies.

Studies on Body Composition

In the past forty years numerous research studies have been conducted on the analysis of body composition for the purpose of quantitative appraisal of leanness-fatness ratios. Such studies have been conducted both in medical practice and in laboratory research. The measurement of body fat provides valuable information regarding an individual's overall health and fitness level. The characteristics of body composition do not remain the same throughout life, rather body composition is in a continual state of change. This continual process of change manifests itself in the relationship between body weight, and percentage of body fat and lean body mass. During a period of intensive muscular activity, body weight may or may not

change, but the amount of total body fat decreases sharply with the development of lean body mass. After substantial reduction of muscular activity, changes in the opposite direction take place--lean body mass decreases and fat accumulates (Parizkova, 1963). Apparently the degree and intensity of physical activity is an important factor contributing to changes in body composition. Other factors such as nutrition, sex, race, and age have also been reported as affecting body composition to some degree. The most thoroughly explored factor has been age. No conclusions have been reached on whether an increase in body fat is a necessary accompaniment to aging, or whether it is just a reflection of physical inactivity.

Body Composition Studies in Young and Middle-Aged People

Cross-sectional investigations of differences in body composition have been conducted by a number of authors. Most studies report that body fat content increases with age until the sixth decade of life in both sexes (Shephard et al., 1969; Gary, 1977; Masoro, 1981). A Ten-State Nutrition Survey conducted from 1968 to 1970 found that in both sexes the long period of fat gain in adults peaked at about the age of fifty (Garn, 1976).

In another cross-sectional study, women who lived in a university community in New York State were investigated for body composition factors. Young et al. (1963) found that the percentage of body fat remained unchanged until about the age of 40 years; thereafter, the body fat increased with age. Middle-aged women at

mean age 60.3 years were one and one-half times fatter than younger women at mean age 20.4 years. These findings revealed a mean increase in body fat of 23.1% in the fifth decade, 46.0% in the sixth decade and 55.3% in the seventh decade.

Similar findings were reported in another study using a wider age range. In Novak's (1972) study the subjects were 305 adult men and women whose ages ranged from 18 to 85 years. Lange skinfold calipers was used for determining fat folds. Novak found that fat content in women changed with age from 33% for the 18-25 age group to 44.8% for the 65-85 age group.

Further evidence that changes in body fat percentages can be attributed to age-related factors are supplied by the studies of Wessel (1963), Parizkova (1971), Chen (1953), Myhre and Kessler (1966). Each of these cross-sectional studies revealed a marked increase in skinfold thickness over the course of the adult life span.

Given the consistency of this evidence, there seems to be little doubt that there is a fairly consistent increase in body fat during the adult years.

It is well documented that an individual's total body weight increases from 25 to 45 or 50 years of age. Thereafter begins a progressive decline (Wyndham et al., 1970; Bjelka, 1971; Timiras, 1972). This increase in body weight is generally due to an accumulation of fat (Shephard, 1978). Several studies demonstrated a trend toward both increased body weight and increased body fat as characteristic of aging.

Wessel (1963) investigated the age trends of various components of body composition and functional characteristics in 30 Michigan women aged 20 to 69 years. She noted that body weight curves showed a sharp increase in the 40's and 50's, and continued through the 60's but indicated a downward trend in the 70's. Similarly, Novak (1972) indicated that in women body weight increased steadily with age, and that the 45-55 year olds had the maximal weight gains. Further evidence, supplied by Shephard's data from Canadians living in the Toronta area, indicated that excess body weight diminished in the sixth and seventh decades, but the thickness of subcutaneous fat remained unchanged or even increased. Weight loss in the older age group was due to atrophy of lean body tissue rather than to loss of fat (Shephard, 1978).

In summary, the investigators used age as the independent variable to elucidate developmental changes in body composition over time.

The interaction effect of age and physical activity was also studied by Parizkova (1971). A group of young inactive students, mean age 20.7 years was compared with a group of elderly men with sedentary occupations. The latter group was further subdivided into two subgroups according to lifelong habitual physical activity. The active elderly men (with a mean age of 72.4 years), had participated in different sports activites for at least 45 years. The inactive elderly men (mean age 73.9 years) had never engaged in any type of sports activity. Both active and inactive groups of elderly men were

followed longitudinally for 8-10 years. The body composition of all subjects was measured by either the hydrostatic weighing technique or by skinfold measurements. The results showed that body weight, height, and amount of lean body mass were significantly higher in the young group than in either subgroup of elderly men. The proportion of body fat was, however, significantly higher for both groups of elderly men. The difference in body composition between active and inactive elderly men was not significant. This study revealed that aging was accompanied by a marked decrease in lean body mass. This conclusion regarding lean body mass is consistent with other findings that lean body mass does not remain constant throughout life, but instead deteriorates markedly with aging, although it fluctuates with variations in physical activity during the period of growth and development (Parizkova, 1963, 1966)

Other evidence of lean body mass declining with age and based on cross-sectional data (Novak, 1972; Forbes, 1976; Gary et al., 1977) are supplied by another longitudinal study. Forbes' results (1970) indicated that during young adulthood and middle age there was an age-related loss in lean body mass of about 3 kg. per decade.

Further evidence of changes in lean body mass can be found in studies dealing with the influence of physical activity on adults' body composition. In this regard, Parizkova (1963) states that:

> If we compare groups of individuals trained and untrained in physical activity....we always find a greater proportion of lean body mass in the physically highly active individual than in the indivi-

> dual unaccustomed to physical activity. The greatest differences are found in individuals after 20 years of age (p. 664).

Physical Activity and its Effect on Body Composition

The role of physical activity in effecting changes in body composition seems to be an important factor. Parizkova has conducted numerous studies and has published several articles on the impact of age and physical activity on body composition. She emphasized that one of the most important factors influencing body composition is the intensity of physical activity, regardless of age (Parizkova, 1963).

Likewise, Harris (1973) found that the degree and intensity of physical activity were the two most important factors influencing body composition--regardless of the individual's age.

Empirical evidence for these conclusions is supplied by a number of studies. Data compiled in Parizkova's 1964 study demonstrated that repeated periods of intensive physical activity gradually lowered the percentage of body fat and increased the lean body mass of youth, adults, and the aged. Additionally, she found that athletic women had a greter amount of lean body mass and a lower percentage of body fat during the training season than after cessation of training, although their body weights remained the same. In another study (Parizkova, 1963) where members of the male and female national gymnastics teams were subjects, a similar result was found. During intensive training, body weight did not change, but the amount of body fat decreased as lean body mass increased. After interruption

of training there occurred a reduction in lean body mass, accompanied by an accumulation of fat.

Similar changes can be found in other sports. Wilmore (1977) investigated the female distance runner and concluded that exercise was a primary factor in both control and alteration of body composition. Lundegren (1969) conducted a similar study on women varsity basketball and field hockey players. Significant fat reduction at the completion of the exercise training program was reported.

In another study (Johnson et al., 1972), 32 college females participated in a ten-week exercise program. Fat content and other functional characteristics of the body were measured. The authors concluded that the exercise program produced a decrease in body fat--as determined by skinfold measurements--with no significant change in body weight.

Moody et al. (1969) reported an average reduction of 32% in the means of 12 skinfold measurements for 11 moderately overweight college women. The eight-week exercise program involved jogging and walking everyday, six days per week. The authors indicated that total body fat decreased and lean body mass increased, with an accompanying weight loss of over five pounds per subject by the conclusion of the program.

In summary, research on adult body composition demonstrates that physical activity and exercise training have a significant impact on body fat and lean body mass. There is a marked difference in body composition between individuals participating in and those not

participating in physical activity. Furthermore, the degree and intensity of physical activity accounts for a substantial portion of the difference in body composition. Decreased physical activity, such as the interruption of a sports training session, leads to an accumulation of fat and a reduction in lean body mass.

Body Composition Estimated from Skinfold Measurements

Because laboratory methods for determining body composition are time-consuming, and require elaborate equipments, the caliper measurement of skinfold thickness has increasingly been employed as a practical field test to assess subcutaneous fat. It has also been used indirectly as a quantitative index of body fat. Lohman (1981) states that:

> Skinfold thickness measurements have been shown to be a fairly accurate approach to the measurement of subcutaneous fat at a given location, and evidence supports the notion that the sum of several skinfold sites is a good measure of total subcutaneous fat. Since total subcutaneous fat is associated with total body fat it is believed that the sum of several skinfolds can be used to estimate total body fat (p. 184).

The empirical evidence of skinfold measurement, as an accurate estimate for determining body fat, is found in many studies (Jackson et al., 1980, 1978; Durnin et al., 1967, 1974; Jackson, et al., 1977; Katch, 1968; Young et al., 1963; Sloan, 1962; Keys and Brozek, 1953; Durnin and Rahaman, 1967). Since Brozek and Keys (1951) first used hydrostatic weighing as the criterion for developing a prediction equation, numerous equations using the sum of several skinfold sites have been developed for different populations (Pollock et al., 1975,

1976, Jackson and Pollock, 1978; Jackson et al., 1980; Durnin and Wormersley, 1974; Sloan, et al., 1962; Wilmore and Behnke, 1969, 1970).

It is estimated that in the past 30 years well over 100 prediction equations have been derived from skinfold alone, or from combinations of skinfold measurements and the anthropometric approach (Lohman, 1981).

Jackson et al. (1980) used a sample composed of a heterogeneous population. Quadratic regression analysis was employed to develop a generalized equation for women varying in age and body composition.

Jackson's (1980) Generalized Equations for Predicting Body Density in Women

A total of 249 adult women between the ages of 18 and 55 years volunteered as subjects. This sample included a wide range of women, varying considerably in age and body composition. Skinfold fat was measured at the chest, axilla, triceps, subscapula, abdomen, suprailium and thigh with a Lange skinfold fat caliper. Recommendations published by the Committee on Nutritional Anthropometry of the Food and Nutrition Board of the National Research Council (Keys, 1956) were followed in obtaining skinfold fat data. Gluteal circumference was measured with a Lafkin steel tape. The independent variables were the quadratic form of the sum of three, four and seven skinfold fat measurements in combination with gluteal circumference and age. The dependent variable was the hydrostatically determined body density. The multiple regression coefficients were tested to

determine if each independent variable was related to the dependent variable. The coefficient ranged from 0.842 to 0.867 with standard errors of 3.6% to 3.8% fat. The equations were cross-validated on a different sample of 82 women with similar age and body characteristics. The coefficients ranged from 0.815 to 0.820 with standard errors of 3.7% to 4.0% fat. Findings of this study support the concept of a generalized equation for adults differing in age and body compositon (Pollock, et al., 1975; Jackson and Pollock, 1977, 1978; Katch and Michale, 1968).

One of the 18 equations, which uses age and the sum of three specific skinfolds (triceps, thigh, and suprailiac) as variables, is recommended by the authors. They state that:

> It would be the most feasible for mass testing, and its cross-validation statistics are similar to the values found with the other 17 equations (p. 181).

The correlation coefficient between this equation and the hydrostatically determined value is 0.842 and 0.820 with standard error of 3.9% fat and 3.7% fat for 249 validation samples and 82 cross validation samples, respectively.

Skinfold Measurement Techniques

Apparently, when body composition is assessed by the skinfold technique alone, the investigator must be skilled in measuring techniques in order to eliminate as much error as possible. In a study of the learning effect in skinfold measurements, Mayhew (1973) established the importance of sufficient practice before collecting the

data. Likewise, Lohman and Pollock (1981) indicated that researchers should practice on between 50 and 100 subjects before adequate proficiency is attained.

Sills (1974) noted that it is important not to repeat the measurement over the same site within a short period of time, particularly on overweight subjects. Mayhew (1973) recommended investigators practice extreme care in the use of the skinfold measurement technique by:

(1) locating the appropriate site as precisely as possible,

(2) pinching the skinfold between the thumb and forefinger with constant pressure,

(3) applying the calipers at the midpoint of the skinfold, and

(4) taking the measurement after the initial rapid fall of the indicator needle but before the secondary slower decline (p. 5).

Studies on Body Cathexis

Individual differences in degree of satisfaction or dissatisfaction with various parts or functions of the body have been investigated by Jourard and Secord in a series of studies (1954, 1955).

Secord and Jourard devised the body cathexis scale by which subjects rated different areas of their bodies on a five-point scale ranging from "strong positive feelings" to "strong negative

feelings". It was hypothesized that body cathexis was integrally related to the individual's self-concept, although identifiable as a separate aspect (Secord & Jourard, 1953). The body cathexis theory maintains that when an individual's body corresponds with the ideal, positive feelings result.

Secord and Jourard's scale (1953) has been most frequently used in studies investigating such areas as (1) the relationship between self-concept and body concept; (2) the individual's attitude toward his or her body size; (3) accuracy in estimating personal body size; and (4) alteration of body image due to involvement in a physical activity program. Each investigated area has, in turn, revealed some interesting results.

Empirical work concerned with the correlation between body concept and self concept has been numerous. Fairly high positive correlations between self concept and body concept have been reported in many studies (Fisher, 1970). Jourard and Secord (1954, 1955) demonstrated that body cathexis was significantly related to feelings about the self. Substantiating these findings were the reports of Johnson (1956), Weinberg (1960), Gunderson and Johnson (1965), Doudlah (1962), and Pollard (1975). Each of these studies confirmed that body concept and self concept were significantly interrelated.

Sex related differences in attitudes toward body size have been a subject of interest to many investigators. In one study, Jourard and Secord (1954) had 62 college males fill out the body cathexis scale and then took anthropometric measurements of their height,

weight, shoulder width, circumference of chest and biceps. Correlations were computed between these measurements and pertinent body cathexis ratings. The low but significant correlations indicated that a large size for the relevant body part is associated with positive feelings, while the reverse is true for a small size. In other words, a positive body concept was associated with bigness in this male group. Magnussen (1958) successfully replicated these findings in another sample of male subjects.

The female's attitude toward body size was also studied by Jourard and Secord in 1955. Sixty-two college females served as subjects. The correlations were computed between anthropometric measurements and body parts, according to the body cathexis scale. Results showed that in the female group positive feelings toward body parts were linked with smallness in the size of those parts. The only exception was in the size of the bust.

Calden et al (1959) studied sex-related differences in attitudes toward body size. Their findings were consistent with the above studies. The authors concluded that males prefer largeness of body proportions. Females, on the other hand, wish to be smaller in all body parts, except for the bust. The women's preference for small body proportions was also supported by the findings of Singer and Lamb (1966).

The accuracy of estimating one's body size, based on sex, has been stated by Fisher (1970):

> No consistent sex differences have been observed in accuracy of body size estimation or in tendencies

> to over or under estimate the sizes of one's body parts. Men who actually possess large body size or who are mesomorphic seem to regard their bodies more positively than do small men or non-mesomorphs. Simple equations of this sort do not seem to apply to women. Women are inclined to give more differentiated judgments about their satisfaction with various sectors of the body than do men (p. 29).

Other pertinent aspects of body size studies have dealt with the relationship of body cathexis ratings to the discrepancy between an individual's perceived ideal size and the actual size of his or her body parts. It was found that the greater the discrepancy between ideal size and the actual size for certain body parts, the more negative the ratings on the cathexis scale (Jourard & Secord, 1955). Cremer and Hukill's findings (1969) also demonstrated a similar trend in which college females with body measurements furthest from generally accepted "desirable" height-weight standards demonstrated the least satisfaction with their own bodies. These findings seem to suggest that there are shared group norms concerning the ideal dimensions for each body part. And each person's attitude toward his or her own body is a function of the degree of deviation of the parts from the ideal norm.

The body cathexis of people in different age groups is one of the research problems addressed by the current study.

Plutchik (1973) conducted a study on male and female subjects whose ages ranged from 18 to 90 years old. He asked each participant to place a dollar value on each of several body parts. The data revealed that there was no significant relationship between age and the

dollar value an individual placed on his or her body parts. The author further concluded that self esteem and self-concept were more crucial in contributing to impaired body image than was the physiological decline which accompanies normal aging.

ages were subjects, Fisher (1969) found that body image was uninfluenced by age.

In contrast to these findings is the assumption that natural physiological changes accompanying aging demand a new structuralization of body image. In a recent study (Martin, 1983) 475 subjects aged 9-18 years were asked to rate satisfaction with body characteristics on a six-point scale. Both sexes showed an increased dissatisfaction from the age of 9-10 years and again from 11-12 years and a slow decrease in dissatisfaction thereafter to the age of 17-18 years. These results provided evidence that variations in body satisfaction were partially influenced by bodily changes. However, the age group for this study was much younger than those in any of the earlier studies in which college age and older subjects were used. Thus, a direct comparison can not be inferred.

Physical Activity, Body Image, and Body Satisfaction

The difference in body cathexis between physically active and physically inactive individuals is a major concern of this study.

The relationship between body image and an individual's movement experiences has been reported in many studies. Harris (1972)

indicated that a clear body image may encourage movement, while a negative body image may promote a dislike and avoidance of movement. In support of this view, Kreitler's data revealed that distortion was common among members of the older population, as heavier and broader than they actually were. He attributed this distortion to the result of inactivity during the adult years, and as the primary reason for an elderly person's view of exercise as increasingly strenuous (Brunner, 1970).

Thus the individual is caught in a vicious cycle: inactivity distorts body image; distorted body image in turn promotes further inactivity; and on it goes. Further evidence of the impact of inactivity on body image can be found in other studies. Hellison (1969) found that college students with a history of inactivity showed a more negative attitudes toward their bodies than did students with a history of activity. Kreiller (1970) reported that people who seldom engage in movement demonstrated a more distorted body image than people who lead relatively active lives.

The positive effects of physical activity and sports participation on an individual's body image have been evidenced in numerous studies. Ismail (1973) investigated the impact of a jogging program on middle-aged men and concluded that many of the psychological changes at the completion of the program could be attributed to an improved self-image derived from an increasingly positive body image. Hellison (1969) studied the effect of an eight-week physical conditioning program on affective attitudes toward the body of male

college students. Twenty-seven subjects were assigned to a four day per week experimental group, while 22 subjects were assigned to a two day per week experimental group. A semantic differential instrument was designed to measure their attitudes toward their bodies. Some improvements were observed in both of the experimental groups at the conclusion of the training program. No significant changes occurred in the non-exercising group, however.

Another study (Metcalfe, 1980) used state employees as subjects. A ten-week exercise program was conducted to examine alterations in body cathexis of the participants. The results again confirm previous findings. The author concluded that the exercise program improved a participant's body image even if there was no loss in body weight or change in body fat.

Further evidence of the effect of exercise on body image was provided by Collingwood and Willett (1971). They investigated the effects of physical training on the attitudes of obese teenagers toward their bodies. The subjects were enrolled in a special Y.M.C.A. physical training program for a total of 30 hours over a 3-week period. The authors found a significant increase in physical fitness performance as well as improved body image as a result of exercise participation.

A recent study (Engelman et al., 1982) comparing different techniques utilized in three different groups revealed some interesting results on the variation of body cathexis. Forty-five subjects (mean age 38 years) in a non-body oriented group therapy, 33 subjects (mean

age 25 years) in a yoga group, and 42 in a control group (mean age 23 years) all completed the cathexis scale before the group meetings and again 10 weeks after the group meetings. In comparison with the controls, the yoga participants improved significantly more on body cathexis. The therapy group did not show significant body cathexis changes in comparison to controls. Empirical evidence thus indicates that physical activity may contribute to the development of a sound body image.

Other studies have further investigated the degree or intensity of exercise participation on body image. Snyder and Kivlin (1975) used a modified body cathexis scale to study the psychological well-being and body image of women. Two hundred and seventy-five college females served as a non-athletes group, three hundred and twenty-eight women participating in the Women's National Intercollegiate Championships or in the 1972 Olympic Tryouts served as an athletes' group. The degree of sports participation was found to have a positive relationship to the body image measure for women. The women athletes clearly showed more positive feelings toward their bodies than the non athletes, especially on key items for athletes such as energy level and health. A follow-up study by Snyder and Spreitzer (1976) using adolescent girls further supported the previous findings that female athletes' perception of their bodies were more positive than those of the non athletes. Also reporting similar findings was Joesting (1981) who found that college students who participated in five or more hours of physical activity per week scored higher on the

body cathexis scale than those who exercised fewer than five hours per week. This substantiated similar results found by Joesting and Clance (1979) who reported that runners had a significantly higher mean score on body cathexis than did non-runners.

A number of researchers subscribe to the hypothesis that physical fitness is associated with sound emotional health, whereas a low level of physical fitness is linked with poor emotional health. In this regard, Kane (1972) indicated that of 17 studies on the relationship between physical fitness and various aspects of emotional health, 13 reported a positive relationship between fitness and emotional health, together with a negative relationship between fitness and symptoms of emotional disturbance. Likewise, Folkins and Lynch (1972) investigated changes in personality, mood, and work behavior of college students who enrolled in a jogging course. They concluded that the psychological benefits of exercise were closely related to the individual's physical fitness level. Those persons who maintained a higher level of fitness demonstrated a more positive view of themselves.

According to Schilder (1950), it is logical that as individuals exercise, there is an increased awareness of the body, its parts, and functions. Thus, there exists a close reciprocal relationship between the development of body image and the development of motor skills. Employing the Smith-Clifton Perception Checklist and the Hunt-Weber Body Image Projective Test as instruments, McBee (1962) indicated that a secure body image in college women was significantly related to the individual's secure feelings about her movement per-

formance. Subjects who had positive feelings toward jumping and throwing also showed secure body image. Those who expressed negative feelings toward jumping and throwing, likewise, displayed insecure body image. Apparently, the ability to perform motor skills is related to the individual's body image.

The sense of success or failure in physical activity is another area which has been found to have an impact on body image. Thomas (1971) reported that college males who failed at a physical task involving a stationary exercise bicycle demonstrated a significant decrease in the physical activity component of body image as measured by Osgood's Semantic Differential Scale. The author suggested that physcial activity which did not consistently involve successful experiences would not result in a positive development of the self. Read (1968), who manipulated the winning and losing records of physical contests reported that body image could be altered positively through winning. He concluded that constant winning or constant losing significantly influenced the body image among the participants.

In summary, the postiive effect of exercise participation on body image has been evidenced in many studies. Body image is enhanced by the individual's level of physical fitness as well as by his or her performance of various motor skills--especially those which pertain to the individual's physical competency. In this regard, Harris (1973) states:

> Physical activity and sport experience provide tremendous opportunities for the individual to experience a sense of success and satisfaction which reinforces a positive sense of self. Further, with the interrelationship of the body and self concept, it is apparent that any experience which serves to enhance a positive perception either of the body or the self will enhance the positiveness of the others (p. 175).

Body Cathexis Scale

A review of the literature finds that many procedures for determining an individual's body image have been created and employed in the past. Procedures and techniques such as drawing a person, word association games, use of distorting mirrors, body value task performance, size estimaton, and tachistoscopically presented pictures of distorted bodies have been used. Each method has its specific purpose and procedures.

The Body Cathexis Scale, devised by Secord and Jourard in 1953, is an objective measure of the strength and direction of an individual's feeling toward his or her body. The term body cathexis represents the satisfaction or dissatisfaction that the individual expresses in respect to various parts and processes of the body. A five-point scale is used to categorize the subjects' feelings about these various body references. The following classifications are used: (1) strong negative feeling, (2) moderately negative feeling, (3) no feeling one way or the other, (4) moderately positive feeling, and (5) strong positive feeling. Scoring of this instrument is such

that a low rating indicates a negative body image while a high rating indicates a favorable body image.

Jourard and Secord (1954) originally reported that body cathexis was significantly related to feelings about the self. Johnson (1956) and Gunderson and Johnson (1965) substantiated the correlation between body cathexis and self cathexis. Secord and Jourard (1953) utilized a Homonym Test in their studies; this test required the subject to respond with word associations to a series of words having common body or non-body meanings. It was assumed that a high number of body associations was correlated with more concern over one's body. Secord and Jourard found a significant positive relationship between homonym scores and the index of body anxiety as derived from items in the body cathexis scale. In addition, Secord and Jourard (1953) found that psychological insecurity, as measured by the Maslow Security-Insecurity Inventory, was positively linked with anxious or negative concern on the body-cathexis and self-cathexis measures. Weinberg (1960) attempted to cross-validate the results. He administered the Homonym Test, the Body Cathexis Scale, and Maslow's Security-Insecurity Inventory to 212 college men and women. The results, in general, supported the previous observations.

The reliability of the Body Cathexis Scale has been reported to be $r = .91$ for split-halves analysis (Jourard and Remy, 1955). Test-retest reliability over a 6 to 8 week interval has been reported as .72 (Wiley, 1974). In another similar study, Tucker (1981) administered the scale to 83 college male students. The test-retest

reliability coefficient was .87. These findings suggest that the Body Cathexis Scale is stable over time.

Attitudes toward Obesity

The social stigma of obesity affecting the life of obese persons has been reported frequently in the literature (Brown and Wadden, 1983). Obese persons suffer not only from the social and sometimes physical disability of being overweight, but they are also blamed for their condition (Brownell, 1982). Unlike persons with other physical disabilities, obese persons are given labels that connote irresponsibility, such as self-indulgence, gluttony, and laziness (Brown and Walden, 1983). Staffieri (1967) had boys assign characteristics to silhouettes of fat, thin, and muscular boys. Responses to the muscular silhouette were positive, while the fat body type was characterized by labels such as lazy, ugly, sloppy, and stupid.

Two other studies had children and adults rate 6 line drawings depicting normal children. The obese child was consistently rated as least likeable (Maddox et al., 1968; Richardson et al., 1961). College females were surveyed about their attitudes toward obesity. Subjects were classified into normal weight, overweight, and obese according to body fat content determined by skinfold measurements. None of these three groups showed a willingness to have an obese mate (Chambless, 1977).

A great deal of discrimination directed toward the obese has also been reported. Discrimination appears in fewer job

opportunities, advertisements that show only figures of well-proportioned people, and television and movies that portray obese people as unsuccesful incompetents (Mayer, 1972; Kalish, 1972; Berland, 1974).

All of these facts tend to imply the social bias against obese people. Obese people themselves hold a negative attitude toward obesity (Leary, 1977). However, when studies explore an individual's attitude toward his or her own weight--whether the subjects are normal weight or obese, the results have been very revealing.

In one study (Osancova and Hejda, 1975), a survey was conducted in a population where an excessive food intake and a high prevalence of obesity were obvious (the majority of the subjects were more than 15% above their ideal weight). Knowledge about the health hazards of obesity and the subjects' attitudes toward personal body weight were surveyed. The results showed that 60% of the respondents were aware of the risk factors associated with obesity, and many even had some knowledge about nutrition and energy balance which could help them to lose excess body weight. Despite these facts, 8% of the women with normal weight wished to put on more weight and 17% of the severely obese subjects were happy with their current weight. Two percent of the obese individuals even wanted to gain more weight.

In another study (Ashwell, 1974), 2400 men and women were questioned if they considered themselves as either underweight or suitable for their height. Subjects' heights and weights were measured and then classified according to the Metropolitan Life Insurance

Table. Almost all of the overweight women knew that they were overweight, but 1/3 of the overweight men thought their weight was suitable. The majority of the women (80%) had tried to reduce their weight but less than 50% of the men had ever tried.

It appears that the adverse effects of obesity do not motivate weight reduction in some groups of people. A recent study (Stock and Rothwell, 1982) reported that at least 25% of the British population was trying to lose weight at any one time. It was likely that some of these people were not excessively overweight or obese, and that there were some who were grossly obese but were simply making no effort to lose weight. What factors influence people to maintain or to achieve appropriate body weight, and what influences some obese people to resist weight reduction? The notion tht the general public is not informed about nutrition, overweight, obesity, energy balance and related health risks as stated by Fullerton (1978) is one interpretation. Epidemiologic study of the prevalence of human obesity may provide additional interpretations. Salans (1979) states that:

> The prevalence and course of human obesity is strongly influenced by social, economic, racial and ethnic factors. These data demonstrate that obesity is....highly prevalent among middle-aged women of low socio-economic status, and in certain racial and ethnic groups. It is possible that this uneven distribution of obesity is a reflection of different underlying attitudes toward eating and obesity in the different strata of our society. (p. 75)

Salans' statement points to the prevalence of human obesity and its relationship to the social, economic, and cultural factors which

affect every individual. These factors, in turn, may affect the individual's attitude toward obesity to some degree.

Factors Contributing to the Prevalence of Human Obesity

Salans (1979) states that:

> Cultural factors operating in social groups or within a family may determine opinions on what constitutes an appropriate body weight. These cultural attitudes may also influence what is regarded as the proper composition and size of meals. Some generations and some cultural groups feel more strongly than do others that....the enjoyment of food may become an important part of their lives (p. 76).

Educational level is one variable which is found to be significantly related to obesity. Collecting data from 400 women who attended a health maintenance clinic at Thomas Jefferson University, Herman (1973) concluded that women with less than 12 years of education were more likely to be obese than those with more years of education.

Social factors have drawn the attention of a number of investigators and have consistently been reported as influencing in a significant way the prevalence of obesity. Stunkard (1980) emphasizes that:

> ....social factors must be considered as among the most important, if not the most important, influence on the prevalence of obesity today....whatever its genetic determinants and biochemical pathways, obesity is to an unusual degree under the control of social environment (p. 439).

A number of research findings support this view and demonstrate that social class is a powerful indicator of obesity (Silverston et

al., 1969; Penick and Stunkard, 1970). Moore, Stunkard and Srole (1962) analyzed data from a representative sample of 1660 adults in New York City's Manhattan area and found a striking relationship between obesity and social class. Obesity was seven times more frequent among women of the lowest social level. Among men a similar relationship existed but to a much lesser degree. The subject's social level was determined by a score based on education, occupation, income, and rent. Each one of these variables was found to correlate with the prevalence of obesity--with the relationship being stronger for women than for men (Stunkard, 1979).

Further evidence was found in another extensive study by Goldblatt et al. (1965). The data revealed that 30% of women with a lower socioeconomic status were obese, compared with 16% in the middle class and no more than 5% in the upper class.

In summary, socioeconomic status, educational level and cultural background are important contributors to the development of human obesity. Obesity is, in large part, a function of lifestyle, and ultimately, of powerful social and economic forces.

Attitude Toward Obesity Scale

Bray (1973) created an attitude scale to measure social attitude toward obesity. This scale was selected after an extensive and thorough review of the literature of obesity as a major health problem. As the result of this process, 120 statements were initiated which were collected from medical publications, physical education

journals, nutrition publications, newspapers, and conversations with professors. These statements were further refined, reviewed, and combined by Bray into a shorter, revised form containing 76 statements. Content validity was then established through a panel of eight expert judges. Those statements which did not receive votes from at least six of the eight judges were eliminated from the scale. This validation procedure resulted in a final set of 47 statements. Bray's Attitude Toward Obesity Scale (1973) is a Likert-type scale in which the respondent is asked to respond to each statement according to one of five categories: (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, and (5) strongly agree.

Bray (1973) administered this scale to a randomly selected group of college students to test the reliability of the instrument. The Hoyt's formula of reliability test was employed. A reliability correlation coefficient of .88 was revealed. Leary (1977) administered the Bray's Attitude Scale (1973) to a group of college females. From his study, he concluded that this instrument was a valid and reliable scale.

CHAPTER III

METHODS AND PROCEDURES

The purpose of this study was to determine if significant differences exist in women's body composition, body cathexis, and attitudes toward obesity as a function of their age and physical exercise level. This study was conducted at the Human Performance Laboratory at Oregon State University in the Spring Term of 1983. This chapter contains the following sections: pilot study, selection of subjects, data collecting instruments, procedures, and methods of analysis.

Pilot Study

Prior to administering the measurements, a pilot study was conducted with 28 women at the Human Performance Laboratory, Oregon State University. The purposes of this pilot study was threefold: (1) to identify the correlation between hydrostatically determined body fat and skinfold caliper predicted body fat; (2) to test the procedures associated with this study; and (3) to assure the clarity of the questionnaire. The pilot study was initiated in April, 1983 and extended over a one week period. Twenty-eight women varying in age from 19 to 61 years old and practicing differing levels of physical exercise (frequent exercisers, occasional exercisers, and non exercisers) voluntarily participated in the study. These subjects completed the Physical Activity and Body Cathexis Survey. They were

then subjected to two types of body fat measurements, including both the underwater weighing technique and the skinfold fat measurement technique.

Results of the pilot study showed a moderate to high correlation ($r = .78$) between predicted body fat and hydrostatically determined body fat. The questionnaire was considered appropriate for use in subsequent research in terms of the pilot subject's favorable reactions to the form.

Selection of Subjects

This study employed a 3 x 3 factorial design. According to Cohen's (1969) table, the minimum sample size needed for contrasting the data in this study equaled 21 subjects per cell. This sample size assured a power level of .80 where the effect size was set at .40. This power level provides at least an 80% probability that a false null hypothesis will be rejected. This criterion was considered adequate for the analysis.

Several methods were used to recruit subjects for the study.

(1) During the Spring Term of 1983, a letter was sent to the Oregon State University Budget Office requesting a list of current female employees. These included faculty, staff, administrators, and student workers. (see Appendix A).

(2) An advertisement briefly describing the purposes and procedures of the study was placed in the Office and

Personnel Association (OPA) newsletter and in the Oregon State University staff newsletter. (see Appendix B).

(3) With the permission of various authorities, several groups were approached. These included an adult exercise group, a square dance club (in Corvallis, Oregon), a church group (in Lebanon, Oregon), several Oregon State University physical education classes, and the OSU women's intercollegiate basketball and volleyball teams. A brief description of the study was presented and a group of women, who expressed interest in the study, was obtained.

One hundred and fifty women were randomly drawn from the computer list of female employees at Oregon State University. Telephone interviews were conducted to request their participation. Because of illness, absence from work, physical disability, lack of interest, pregnancy, and working schedules, only 40% of these women expressed a willingness to participate. The rest of the subjects were randomly selected from those who responded to the advertisement in the newsletters, and from those involved in the adult exercise group, the square dance club, the church group, OSU physical education classes, and OSU intercollegiate teams.

Requirements for becoming a subject in this study were: (1) the individual's age fell between 17 and 64 years old; (2) the individual had maintained her current exercise pattern for at least three months

prior to participating in this study; and (3) the individual signed a consent form and indicated a willingness to participate (see Appendix C).

All potential subjects were contacted individually. Only those who met the criteria were asked to participate in the research. Pertinent information was then provided to each subject, including time, date, location, procedure, appropriate clothing, and length of time needed to complete body fat measurements.

A total of 216 women participated in this study. They were grouped first by age, and second by exercise level.

Subjects Classified by Age

The college-age subjects were those between 17 and 24 years of age.

The beyond college-age subjects included those between 25 and 39 years of age.

The middle-aged subjects were those between 40 and 65 years of age.

Sub-Classification of Subjects by Exercise Level

All subjects were then sub-classified into very active, moderately active, and relatively inactive, based upon their responses to the Physical Activity and Body Cathexis Survey. (see Appendix D).

The very active subjects were defined as performing a minimum of 120 minutes of exercise during a one-week period and exercising for a

minimum of three days per week. Subjects must have maintained this exercise pattern for at least six months prior to participation in the study.

The moderately active subjects were classified as performing 90-120 minutes of exercise during a one-week period, and exercising for three days per week. Subjects must have maintained this exercise pattern for at least three months prior to participation in the study.

The relatively inactive subjects were defined as those women who had not exercised at all, or who had exercised only on a limited basis in the past three months. Exercise was performed fewer than three days for less than 90 minutes during a one-week period.

Data Collecting Instrument

The Body Cathexis Inventory (Secord and Jourard, 1953) and the Attitude Toward Obesity Scale (Bray, 1973) were employed to assess the subject's feeling toward parts or functions of her body and her attitudes toward obesity. The regression equation developed by Jackson and his associates (Jackson et al., 1980) for predicting body density was used to collect body composition data. Selecting these instruments was based on the following factors:

(1) Several studies had indicated relatively accurate estimation of body fat percentage from selected skinfold fat measurements (Pollock et al., 1975; Jackson et al., 1980; Durnin et al., 1967, 1974; Jackson et al., 1977;

Wilmore et al., 1969, 1970; Katch et al., 1968; Young et al, 1963; Sloan et al.,1962);

(2) Jackson's equation (1980) can be applied to a wide range of adult females varying in age, body structure, and fitness level (Jackson et al., 1980); and

(3) Secord and Jourard's Body Cathexis Scale (1953) is a direct measure of body acceptance, and is considered to be a reliable indicator of feelings toward one's body. The reliability of this scale has been reported as r = .91 for split-halves analysis (Jourard and Remy, 1955). The test-retest reliability over a six to eight week interval has been reported as .72 (Wiley, 1974).

Physical Activity History Questionnaire

Prior to the initial pilot survey, the Physical Activity and Body Cathexis Survey questionnaire was reviewed and refined by the Survey Research Center at Oregon State University. Information regarding each subject's age, exercise habits, the frequency, duration, and intensity of her exercise patterns, her occupational activity, and estimated level of activeness was collected here. These data were analyzed to group the subjects into three age groups and three exercise categories. The form used for the collection of these data appears as Appendix D.

Body Cathexis Inventory

In this portion of the questionnaire the subject was asked to indicate the strength and direction of her feelings toward 40 personal body parts or personal body functions. Each subject circled the number which best represented her feelings, according to the following categories: (1) have strong negative feelings; (2) have moderate negative feelings; (3) have no feelings one way or the other; (4) have moderate positive feelings; or (5) have strong positive feelings.

Scoring of this test instrument was such that the positive end of each item was scored as 5, the negative end as 1, and the middle or neutral as 3. Each respondent's score on each item was summed and divided by 40. The obtained mean score was considered reflective of each subject's body cathexis. Lower (less than 3) scores reflected a negative attitude toward the body, while higher scores (greater than 3) reflected a positive attitude.

Attitude Toward Obesity Scale

This scale was designed to measure social attitudes toward obesity. The subject responded to each of the 47 statements in one of five ways: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. The point value for each category was 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. Statement numbers 54, 66, 69, 78, 80 and 84 were positive statements about obesity, where the point values

were reversed. Statement numbers 59, 68, 73, 77 and 86 were neutral statements; the point values were assigned a zero. The subject's responses on each statement were summed and divided by 47. The mean score index ranged from 1 to 5, with 1 reflecting the most positive attitude, 3 neutrality, and 5 the most negative attitude.

Equations for Prediction of Body Density and Body Fat

Jackson's equations (1980) were employed to assess body density. Skinfold fat data for each subject were collected at triceps, suprailium, and thigh with a Lange skinfold fat calipers. The calipers had a constant pressure of 10 g/mm^2. Measures were taken on the right hand side of the body. Recommendations published by the National Academy of Sciences (Brozek, 1961) were followed in obtaining skinfold fat data. These recommendations state that (1) skinfold 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 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. Measuring sites were located by following the description provided by the National Academy of Sciences (Brozek, 1961). These sites include (1) triceps skinfold--a vertical fold on the posterior midline of the upper arm, halfway between the acromion and olecranon processes with the elbow extended and relaxed; (2) the thigh skinfold--a vertical fold on the anterior aspect of the thigh midway between the hip and

knee joints; and (3) the suprailium skinfold--a diagonal fold on the crest of the ilium at the anterior axilliary line. The skinfold fat sites and caliper placement appear in Appendix E.

The formula for determining body density (BD) and percentage of body fat (%F) were as follows:

$$BD = 1.0994921-0.0009929(X_3) + 0.0000023(X_3)^2 - 0.001392(X_2),$$

where X_2 = age, and X_3 = the sum of three skinfolds (triceps, suprailium, and thigh).

$$\%F = [(4.95/BD) + 4.5].$$

Procedures

All data were collected in the Human Performance Laboratory at Oregon State University. Each woman began with the questionnaire and was then subjected to a skinfold fat measurement. Administering the survey instrument and conducting body fat measurements proceeded in the following sequence:

(1) The subject was directed to a designated area away from the body compositon measuring area in order to keep outside influence to a minimum.

(2) Survey questionnaires were distributed.

(3) The general purpose of the research and the correct method for making responses was described. In all cases the subjects were informed that their anonymity would be protected.

(4) Following completion of the Physical Activity and Body Cathexis questionnaire the subject proceeded to the body fat measurement area.

(5) Body height and weight were first taken consisting of a light top, shorts and no shoes. The nearest 1/4 pound for weight and the nearest 1/4 inch for height were recorded for each subject. Three skinfold measurements were then taken on the right hand side of the body. Each site was measured three times and the average was used as the representative value for that site. If a single measurement deviated from the remaining two by more than 3 millimeters, a fourth reading was taken and the extreme discarded. The form used for recording body composition data appears in Appendix F.

(6) After completing the measurements, each participant was thanked, and told that the results of her skinfold measurement test would be sent at her request. A copy of the results appears in Appendix G & H.

Methods of Analysis

All data were processed and analyzed in the Milne Computer Center at Oregon State University. The statistical tool utilized for this study was the Two-Way Analysis of Variance using the F statistic in testing all hypotheses. The mathematical model for this analysis was $Y_{ijk} = u + \alpha i + \beta j + \alpha\beta ij + \varepsilon ijk$,

where u is a fixed constant,

αi is a differential effect associated with factor 1 (age),

βj is a differential effect associated with factor 2 (exercise),

$\alpha\beta ij$ is a differential effect associated with the interaction of the levels of factor 1 and factor 2, and

εijk is a random variation (NID, ϕ, $\sigma 2$).

The .05 level was adopted to test the significance of the difference. The hypothesis testing was accomplished according to the following analysis of variance arrangement.

Analysis of Variance Table (2-way Fixed Design)

Source of Variation	df	SS	MS	F
Factor 1 (age)	2	A	A/2	MS_A/MS_D
Factor 2 (exercise)	2	B	B/2	MS_B/MS_D
Interaction: Age x Exercise	4	C	C/4	MS_C/MS_D
Error	207	D	D/207	
Total	215			

The Least Significant Difference (L.S.D.) test was then utilized as a follow up procedure for further analysis of rejected hypotheses. The formula for computing the L.S.D. test with unequal sample size among groups is:

$$L.S.D. = t\ \alpha/2 \sqrt{(1/n1 + 1/n2 + \ldots\ldots + 1/ni)\ S^2}\ ,$$

where t $\alpha/2$ represents the t table value at the .05 level of significance,

S^2 represents the variance as estimated by the mean square error,

$n^1, n^2, \ldots\ldots n^i$ represents the number of subjects within each group.

After the L.S.D. was computed, differences between two means were determined by comparison of adjacent ordered means. If the difference between two means was equal to or greater than the computed L.S.D. value, a significant difference between the two compared means was determined to exist. If the mean difference was found to be smaller than the computed L.S.D. value, no significant difference between the two means was concluded.

In addition to an examination of the main effects, when significant interactions were found, a plotting procedure was performed to determine (1) the location of the interaction with respect to age and exercise levels, and (2) whether the type of interaction was ordinal or disordinal.

CHAPTER IV

PRESENTATION AND DISCUSSION OF THE FINDINGS

The findings of this study are presented in six sections: (1) description of subjects; (2) habitual physical exercise survey; (3) skinfold measurement expressed by percentage of body fat (%F) and lean body mass (LBM); (4) body cathexis score; (5) attitude toward obesity score; and (6) summary of findings and discussions.

Description of Subjects

A total of 216 women participated in this study. They were classified into three age groups, then further divided into three activity level categories. Table I presents the sampling matrix employed in this study. Seventy-nine college-age women, 73 beyond college age women, and 64 middle-aged women comprised the study's three age groups. In the three exercise categories, there were 76 subjects at the very active level, 68 subjects at the moderately active level, and 72 subjects at the relatively inactive level.

The means and standard deviations of age, height, and weight data for all the subjects are presented in Table II. These data show the mean ages as 20.1 years for college-age women, 30.43 years for beyond college-age women, and 52.79 years for middle-aged women. In a comparison of the subjects' heights, the college-age women were the tallest with a mean height of 65.69 inches, followed by the beyond

college age-women at 64.6 inches, and lastly by 62.7 inches for middle-aged women. At 137.40 pounds, the middle-aged women showed heavier than either of the younger groups. For beyond college-age women, the mean weight was 133.36 pounds, while college-age women had a mean weight of 135.56 pounds.

Table I

Number of Subjects in Each of the Nine Groups, by Age and Exercise Level

Exercise Level \ Age	College-Age Age 17-24 Years	Beyond College-Age Age 25-39 Years	Middle-Aged Age 40-64 Years	Total
Very Active	31	24	21	76
Moderately Active	21	27	20	68
Relatively Inactive	27	22	23	72
Sub-totals	79	73	64	
Total				216

Habitual Physical Exercise Survey

Three categories of physical exercise level were defined in this study: very active, moderately active, and relatively inactive. They were classified on the basis of the frequency, intensity, and duration of the habitual physical exercise reported by each subject

on the first part of the Physical Activity and Body Cathexis Questionnaire. Responses were calculated and are presented in Table III.

The data reported in Table III reveal that the majority (89.4%) of all subjects engaged in conditioning or aerobic exercises. These exercisers were found in either the very active or the moderately active categories. The remaining subjects (10.6%) who responded that they did not do any exercise were all in the relatively inactive category.

Data concerning the frequency of exercise per week reveal that the majority (78.9%) of the subjects at the very active level exercised more than three times per week. At the moderately active level, individuals in both of the younger age groups reported exercising either two to three times or more than three times per week. The majority (70.0%) of the middle-aged women in the moderately active category reported exercising two to three times per week. Nearly 1/3 of the relatively inactive subjects reported that they did not do any exercise at all. The remaining relatively inactive subjects reported exercising no more than three times a week, and most of them less often.

Data relating to the amount of time spent in exercising on a given day reveal that those who spend from 30-45 minutes to more than one hour were mostly found in the very active category regardless of the subjects' age. Nearly 1/2 of the moderately active subjects exercised between 30 and 45 minutes each time. At the relatively inactive level, there were more individuals exercised for fewer than 30

minutes at an exercise session than at either of the other two activity levels.

The duration of current exercise patterns demonstrates that more than 1/2 of the very active subjects have maintained their current exercise pattern for longer than a year. Moreover, 15.8% of those very active subjects reported exercising in this manner for the preceding six months to one year. Over 40% of the moderately active subjects reported maintaining the same exercise pattern for at least the preceding three months.

Question number two on the questionnaire asked each subject to indicate a list of exercises which she had been doing often, occasionally, rarely, or never. Table IV summarizes the number of subjects who responded often to each one of the exercises. The data reveal that walking was the most popular form of exercise for all the subjects. Jogging was more popular for very active subjects, and dancing was more popular for moderately active subjects. At the relatively inactive level, none of the exercises except walking had been performed often.

The subjects' self-rated level of activeness, concerning their daily exercise and occupational activity, are presented in Tables V and VI.

The data in Table V reveal that all of the very active subjects perceived themselves as either very active (52.6%) or fairly active (47.4%). Over 3/4 of the subjects (80.9%) in the moderately active category considered themselves to be fairly active. More than 1/2

Table II

The Means and Standard Deviations of Age, Height, and Weight for College-Age, Beyond College-Age, and Middle-Aged Subjects by Exercise Level

	College-Age				Beyond College-Age				Middle-Aged			
Variables	Very Act. N = 31	Mod. Act. N = 21	Rel. Inact. N = 27	Total N = 79	Very Act. N = 24	Mod. Act. N = 27	Rel. Inact. N = 22	Total N = 73	Very Act. N = 21	Mod. Act. N = 20	Rel. Inact. N = 23	Total N = 64
Age $\bar{X}$	19.94	19.90	20.48	20.10	29.54	30.89	30.86	30.43	53.05	52.05	53.26	52.79
S.D.	1.50	1.70	1.81	1.67	3.59	4.41	4.69	4.23	8.64	8.15	6.59	7.79
Height $\bar{X}$ (inches)	66.63	64.94	65.51	65.69	64.24	64.58	64.98	64.6	62.48	62.37	63.31	62.7
S.D.	2.84	3.29	2.33	2.82	2.10	2.47	1.99	2.18	2.76	3.03	3.75	3.18
Weight $\bar{X}$ (lbs)	139.65	133.94	132.13	135.56	126.07	137.32	136.47	133.36	128.40	134.75	147.91	137.4
S.D.	16.70	14.85	20.15	17.62	16.46	20.20	14.50	17.94	19.41	19.27	30.88	25.18

Table III

Frequencies and Percentages of Subjects' Reported Habitual Physical Exercise for Very Active, Moderately Active, and Relatively Inactive Subjects, by Age Groups

Variables	Very Active				Moderately Active				Relatively Inactive				Total
	CA N=31	BCA N=24	MA N=21	Total N=76	CA N=21	BCA N=27	MA N=20	Total N=68	CA N=27	BCA N=22	MA N=23	Total N=72	N=216
Do exercise or not													
1. No	0	0	0	0	0	0	0	0	8	9	6	23	23
	0	0	0	0	0	0	0	0	29.6%	40.9%	26.1%	31.9%	10.6%
2. Yes	31	24	21	76	21	27	20	68	19	13	17	49	193
	100%	100%	100%	100%	100%	100%	100%	100%	70.4%	59.1%	73.9%	68.1%	89.4%
Frequency of Exercise per wk													
1. < 2 times/wk	0	1	0	1	0	0	2	2	5	6	5	16	19
	0	4.2%	0	1.3%	0	0	10.0%	2.9%	26.3%	46.2%	29.4%	22.2%	9.8%
2. 2-3 times/wk	6	3	4	13	8	11	14	33	13	5	8	26	72
	19.4%	12.5%	19.0%	17.1%	38.1%	40.7%	70.0%	48.5%	68.4%	38.5%	47.1%	36.1%	37.3%
3. > 3 times/wk	23	20	17	60	13	16	4	33	1	2	4	7	100
	74.2%	83.3%	81.0%	78.9%	61.9%	59.3%	20.0%	48.5%	5.3%	15.4%	23.5%	9.7%	51.8%
4. Other	2	0	0	2	0	0	0	0	0	0	0	0	2
	6.5%	0	0	2.6%	0	0	0	0	0	0	0	0	1.0%
No Response													23

Table III (Cont.)

Variables	Very Active CA N=31	Very Active BCA N=24	Very Active MA N=21	Very Active Total N=76	Moderately Active CA N=21	Moderately Active BCA N=27	Moderately Active MA N=20	Moderately Active Total N=68	Relatively Inactive CA N=27	Relatively Inactive BCA N=22	Relatively Inactive MA N=23	Relatively Inactive Total N=72	Total N=216
Amount of Time Do Exercise/day													
1. <30 min.	0	0	0	0	3	7	4	14	3	11	6	20	34
	0	0	0	0	14.3%	25.9%	20.0%	20.6%	15.8%	84.6%	35.3%	27.8%	17.6%
2. 30-45 min.	11	8	8	27	8	15	8	31	8	2	5	15	73
	35.5%	33.3%	38.1%	35.5%	38.1%	55.6%	40.0%	45.6%	42.1%	15.4%	29.4%	20.8%	37.8%
3. >45 min < 1 hr	5	7	5	17	7	4	2	13	8	0	2	10	40
	16.1%	29.2%	23.8%	22.4%	33.3%	14.8%	10.0%	19.1%	42.1%	0%	11.8%	13.9%	20.7%
4. ≥ 1 hr.	15	9	8	32	3	1	6	10	0	0	4	4	46
	48.4%	37.5%	38.1%	42.1%	14.3%	3.7%	30.0%	14.7%	0%	0%	23.5%	5.6%	23.8%
No Response													23
Duration of Current Exercise Pattern													
1. <3 mon.	6	0	0	6	15	12	3	30	12	6	8	26	62
	19.4%	0	0	7.9%	71.4%	44.4%	15.0%	44.1%	63.2%	46.2%	47.1%	36.1%	32.1%
2. 3-5 mon.	5	6	3	14	5	8	6	19	1	3	3	7	40
	16.1%	25.0%	14.3%	18.4%	23.8%	29.6%	30.0%	27.9%	5.3%	23.1%	17.6%	9.7%	20.7%

Table III (Cont.)

Variables	Very Active				Moderately Active				Relatively Inactive				Total
	CA N=31	BCA N=24	MA N=21	Total N=76	CA N=21	BCA N=27	MA N=20	Total N=68	CA N=27	BCA N=22	MA N=23	Total N=72	N=216
3. 6 mo.-1 yr.	6	6	0	12	1	1	4	6	2	0	1	3	21
	19.4%	25.0%	0	15.8%	4.8%	3.7%	20.0%	8.8%	10.5%	0%	5.9%	4.2%	10.9%
4. > 1 yr.	14	12	18	44	0	6	7	13	4	4	5	13	70
	45.2%	50.0%	85.7%	57.9%	0%	22.2%	35.0%	19.1%	21.1%	30.8%	29.4%	18.1%	36.3%
No Response													23

(62.5%) of the subjects in the relatively inactive category rated themselves as not too active.

Table IV

Frequencies of Reported Exercise Performed Often for Very Active, Moderately Active, and Relatively Inactive Subjects

Exercises	Very Active N = 76	Moderately Active N = 68	Relatively Inactive N = 72
Jogging	37	13	3
Swimming	11	4	2
Dancing	18	23	8
Bicycling	27	20	12
Wt. Lifting	29	5	2
Walking	52	45	28
Calisthenics	14	17	1
Trampoline	3	3	0
Other	19	6	2

Data gathered from the subjects' self-reported occupational activity, as described in Table VI, show that nearly 1/2 of all the subjects in this study responded that a light activity was necessary in their occupations. One-fourth of the very active subjects reported that their occupations required moderate activity. Nearly 1/3 of the relatively inactive subjects, however, rated their occupational activities as sedentary.

Table V

Frequency and Percentage of Subjects' Reported Level of Activeness in Each of Nine Exercise Categories for Three Exercise Levels, by Age Group

	Very Active				Moderately Active				Relatively Inactive			
	College-Age N=31	Beyond College Age N=24	Middle-Aged N=21	Total N=76	College Age N=21	Beyond College Age N=27	Middle-Aged N=20	Total N=68	College-Age N=27	Beyond College Age N=22	Middle-Aged N=23	Total N= 72
Perceived oneself as												
1. Very Active	21	9	10	40	1	3	1	5	0	0	1	1
	67.7%	37.5%	47.6%	52.6%	4.8%	11.1%	5.0%	7.4%	%	%	4.3%	1.4%
2. Fairly Active	10	15	11	36	20	20	15	55	4	8	5	17
	32.3%	62.5%	52.4%	47.4%	95.2%	74.1%	75.0%	80.9%	14.8%	36.4%	21.7%	23.6%
3. Not Too Active	0	0	0	0	0	4	3	7	21	12	12	45
	0%	%	%	%	%	14.8%	15.0%	10.3%	77.8%	54.5%	52.2%	62.5%
4. Not Active at All	0	0	0	0	0	0	1	1	2	2	5	9
	%	%	%	%	%	%	5.0%	1.5%	7.4%	9.1%	21.7%	12.5%

Table VI

Frequency and Percentage of Subjects' Reported Level of Occupational Activity in Each of the Nine Exercise Categories for Three Exercise Levels, by Age Group

	Very Active				Moderately Active				Relatively Inactive			
	College-Age N=31	Beyond College-Age N=24	Middle-Aged N=21	Total N=76	College-Age N=21	Beyond College-Age N=27	Middle-Aged N=20	Total N=68	College-Age N=27	Beyond College-Age N=22	Middle-Aged N=23	Total N=72
Perceived Levels of Occupational Activity as:												
1. Sedentary	1	4	6	11	1	4	6	11	3	9	11	23
	3.2%	16.7%	28.6%	14.5%	4.8%	14.8%	30.0%	16.2%	11.1%	40.9%	47.8%	31.9%
2. Light	14	11	8	33	13	13	7	33	20	10	6	36
	45.2%	45.8%	38.1%	43.4%	61.9%	48.1%	35.0%	48.5%	74.1%	45.5%	26.1%	50.0%
3. Moderate	9	5	5	19	7	9	0	16	4	2	2	8
	29.0%	20.8%	23.8%	25.0%	33.3%	33.3%	%	23.5%	14.8%	9.1%	8.7%	11.1%
4. Heavy	1	2	0	3	0	0	0	0	0	0	0	0
	3.2%	8.3%	%	3.9%	%	%	%	0%	%	%	%	%
5. Other	5	2	2	9	0	1	5	6	0	1	4	5
	16.1%	8.5%	9.5%	11.8%	%	3.7%	25.0%	8.8%	%	4.5%	17.4%	6.9%
Total Number of No Response	3											

Body Composition Measurements

Percentage of Body Fat (%F)

Mean scores and standard deviations for percentage of body fat (%F) for the three age groups and three activity levels are reported in Table VII. The data reveal that very active subjects (mean %F = 23.86) showed the lowest percentage of body fat (%F), ranging from 22.0%F to 28.19%F. The mean %F in the very active category for college-age women (mean %F = 22.00) and beyond college-age women (mean %F = 22.46) was very close. Table VII further reveals an upward increase with age in the mean %F regardless of the subjects' level of physical exercise. The highest mean %F occurred in the over 40 age group (mean %F = 31.47).

The two-way analysis of variance (ANOVA) was used to determine if these differences were statistically significant. The summary table of ANOVA procedures exploring age, exercise, and age x exercise interaction effects on percentage of body fat is presented in Table VIII. The results reveal that the computed F values for age, exercise, and interaction effect of age x exercise were each significant beyond the .05 level. Therefore, each of the null hypotheses was rejected.

The Least Significant Difference (L.S.D.) formula for unequal cell size test was used to determine whether all or some of the means were different from one another. Table IX shows the results of these tests. The college-age subjects (mean %F = 24.27) and beyond

Table VII

Means and Standard Deviations of Percentage of Body Fat (%F) for Three Age Groups and Three Exercise Levels

Group	N	Mean	S.D.
College-Age	79	24.27	3.64
Very Active	31	22.0	2.92
Moderately Active	21	25.48	2.56
Relatively Inactive	27	25.93	3.84
Beyond College-Age	73	26.02	5.43
Very Active	24	22.46	3.76
Moderately Active	27	26.19	4.84
Relatively Inactive	22	29.73	5.26
Middle-Aged	64	31.47	6.89
Very Active	21	28.19	5.01
Moderately Active	20	29.30	6.47
Relatively Inactive	23	36.35	6.15
Activity Groups			
Very Active	76	23.86	4.67
Moderately Active	68	26.88	5.04
Relatively Inactive	72	30.42	6.67
Total Subjects	216	26.99	6.13

college-age subjects (mean %F = 26.02) showed a lower percentage of body fat than the middle-aged subjects (mean %F = 31.47). The difference between the two younger age groups was not significant. However, the mean difference between women 25-39 years old and women over 40 years old was statistically significant at the .05 level.

The effect of the levels of physical exercise on body fat is evidenced in Table IX. The very active subjects had the least amount of body fat (mean %F = 23.86), followed by the moderately active subjects (mean %F = 26.88), while the relatively inactive subjects possessed the greatest amount of body fat (mean %F = 30.42). The differences among these three exercise categories were significant at the .05 level.

Table VIII

Analysis of Variance Table for Age and Exercise Differences in Percentage of Body Fat (%F)

Source of Variation	df	SS	MS	F	Significance of F (P)
Age	2	1716.601	858.300	40.268*	.001
Exercise	2	1520.294	760.147	35.663*	.001
Interaction (Age x Exercise)	4	279.899	69.975	3.283*	.012
Error	207	4412.141	21.315		
Total	215	8088.995	37.623		

*Significant at $p < .05$ level

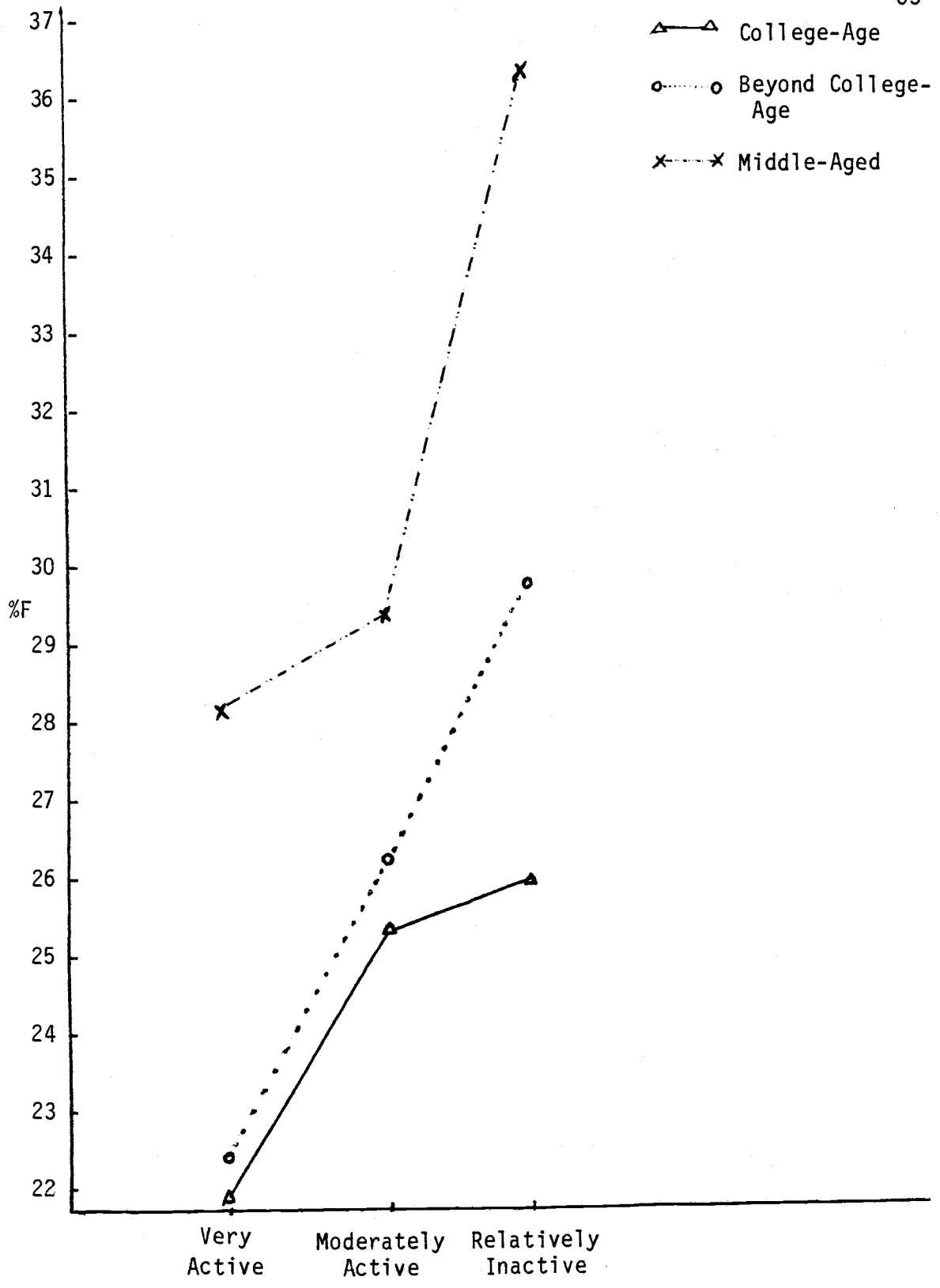
Table VIII shows that there was a significant age x exercise interaction effect. A plotting of each of the nine cellular means is illustrated in Graph 1 in order to interpret the pattern of interaction. The plotted mean lines do not cross and are not parallel, except between levels very active and moderately active with college age and beyond college-age women. Where lines are not parallel, ordinal interaction is present. Graph 1 depicts this condition for the percentage of body fat (%F) variable. Figure 1 illustrates the group means.

Table IX

Interpretation of L.S.D. Test for Three Age Groups and Three Exercise Categories in Percentage of Body Fat

Source	Group	Mean	Difference (subtracted)	Decision	Conclusions
Age	College-Age	24.27	1.75	No Sig.	$M_{CA} = M_{BCA}$
	Beyond College Age	26.02	5.45*	Sig.	$M_{BCA} < M_{MA}$
	Middle-Aged	31.47			
Exercise	Very Active	23.86	3.02*	Sig.	$M_{VA} < M_{MA}$
	Mod. Active	26.88	3.54*	Sig.	$M_{MA} < M_{RI}$
	Relatively Inactive	30.42			

*Significant at the .05 level when df = 215 for the t value, computed L.S.D. = 1.85



Graph 1. The Plots of Means for Each of the Three Exercise Categories, According to Age Group.

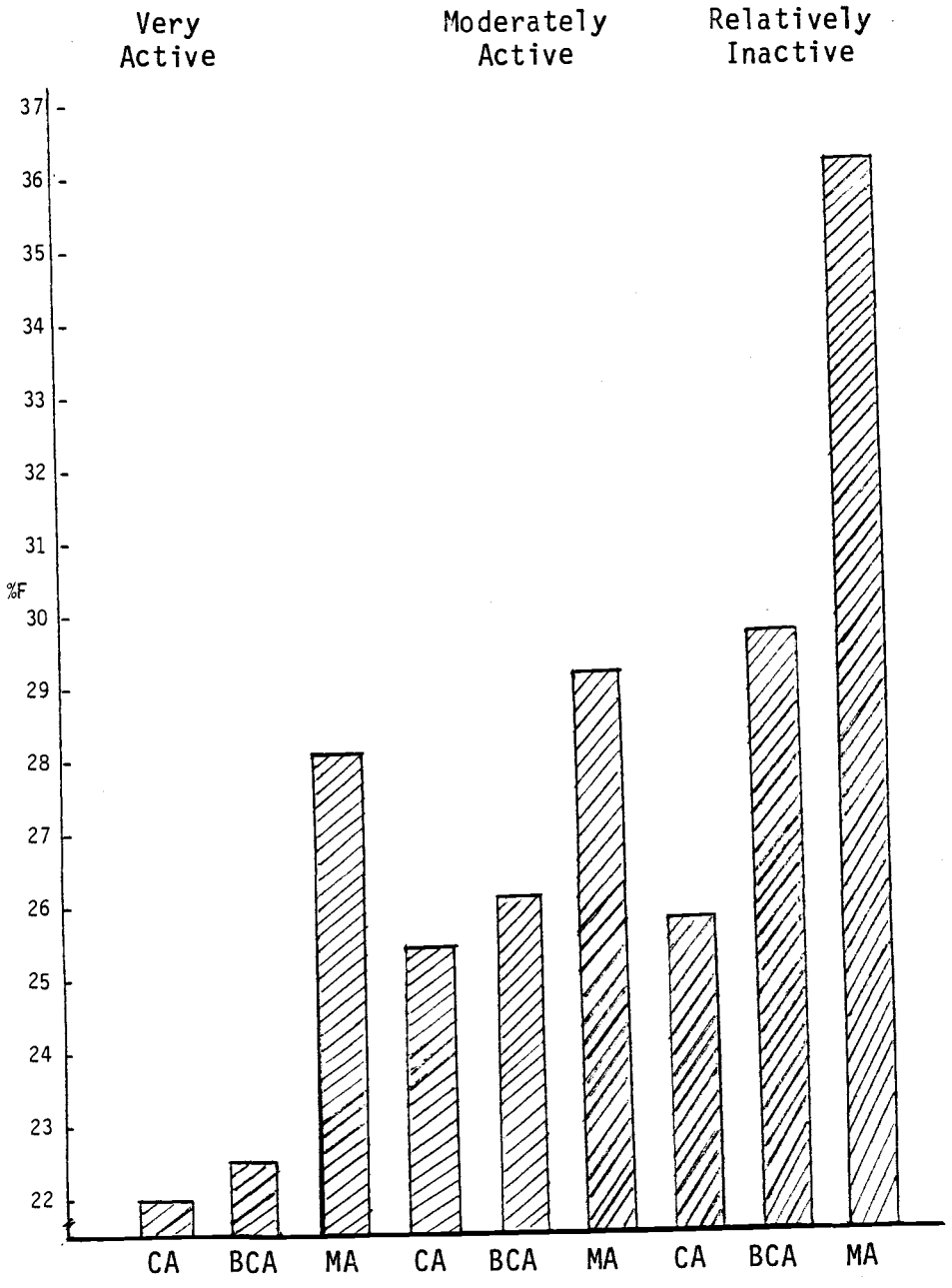


Figure 1. Mean Percentage of Body Fat by Age and Exercise Level.

CA = College-Age

BCA = Beyond College-Age

MA = Middle-Aged

Lean Body Mass (LBM)

The means and standard deviations of the amount of lean body mass (LBM) for subjects divided into three age groups and three exercise categories are shown in Table X. It can be seen that the subjects who maintained a high activity level had a greater lean body mass (mean LBM = 100.50) than those who maintained a moderate or low activity (mean LBM = 98.63 and 95.42, respectively). In addition, the college-age women had a mean LBM of 102.58 pounds, which was greater than that of either the beyond college-age women (mean LBM = 98.09) or the middle-aged women (mean LBM = 92.97).

The two-way analysis of variance was used to determine if these differences were statistically significant. Results are reported in Table XI. It reveals that the computed F values for the factors of age and age x exercise interaction effect were greater than the tabular value at the .05 level. Thus, each of the null hypotheses was rejected. However, the hypothesis of no difference in lean body mass among three exercise groups of women was retained.

The Least Significant Difference (L.S.D.) test was used as a follow up test to determine the location of differences in lean body mass for subjects in each of the three age groups. The results in Table XII indicate that the middle-aged women with a mean LBM of 92.97 pounds had significantly less lean body mass than the beyond college-age women (mean LBM = 98.09). The mean difference in LBM between the college-age women and beyond college-age women was, however, not significant at the .05 level.

Table X

Means and Standard Deviations of Lean Body Mass (LBM) for Three Age Groups and Three Exercise Category Subjects

Group	N	Mean	S.D.
College-Age	26	102.5803	13.67
Very Active	31	108.86	13.24
Moderately Active	21	99.79	11.27
Relatively Inactive	27	97.54	13.46
Beyond College-Age	73	98.09	10.58
Very Active	24	97.62	12.67
Moderately Active	27	100.72	10.69
Relatively Inactive	22	95.37	7.04
Middle-Aged	64	92.97	11.43
Very Active	21	91.44	8.91
Moderately Active	20	94.59	11.21
Relatively Inactive	23	92.97	13.73
Activity Category			
Very Active	76	100.50	13.96
Moderately Active	68	98.63	11.18
Relatively Inactive	72	95.42	11.96
Total Subjects	216	98.22	12.60

A significant interaction effect of age x exercise is reported in Table XI. The pattern of interaction for the lean body mass variable showed a mixed structure of interaction where levels of age are plotted. Graph 2 indicates the measures of interaction. As shown in Graph 2, no interaction appears to be present between very

Table XI

Analysis of Variance Table for Age and Exercise Differences in Lean Body Mass (lbs.)

Source of Variation	df	SS	MS	F	Significance of F (P)
Age	2	2866.222	1433.111	10.471*	.001
Exercise	2	633.321	316.661	2.314	.101
Interaction (age x exercise)	4	1660.756	415.189	3.034*	.019
Error	207	28331.599	136.868		
Total	215	34121.117	158.703		

*significant at the $p < .05$ level

active and moderately active beyond college-age and middle-aged women in terms of lean body mass. Likewise, interaction is not found to be present at the moderately active and relatively inactive levels for college age and middle-aged women. Ordinal interaction is evidenced for all other conditions except all exercise levels of very active, moderately active and relatively inactive college age and beyond college-age women, where disordinal interaction is evidenced. Figure 2 illustrates the nine cellular means.

Table XII

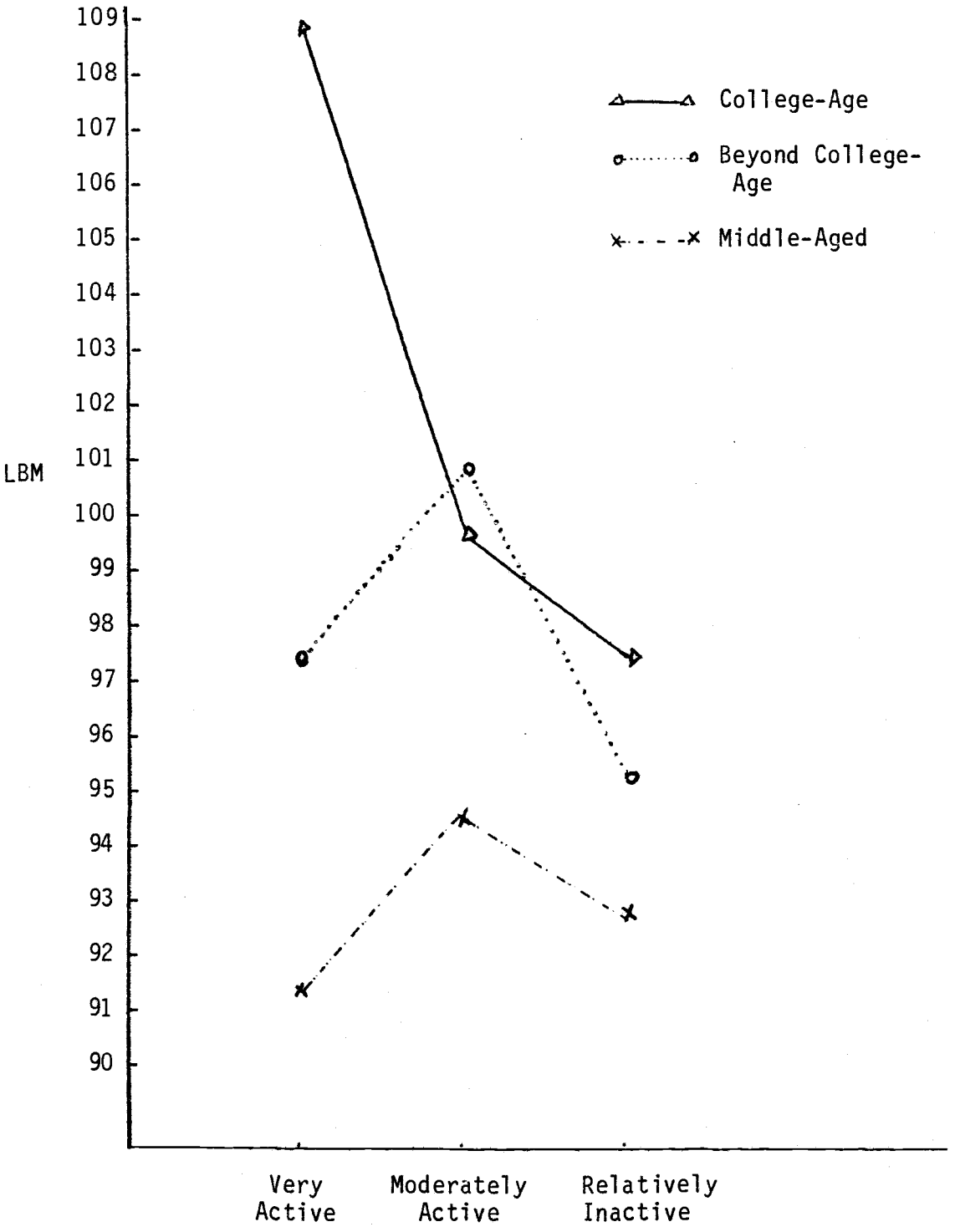
Interpretation of L.S.D. Test for Three Age Groups of Women According to Lean Body Mass

Source	Group	Mean	Difference (subtracted)	Decision	Conclusions
Age	College-Age	102.58	4.49	No. Sig.	$M_{CA}=M_{BCA}$
	Beyond-College Age	98.09	5.12*	Sig.	$M_{BCA}>M_{MA}$
	Middle-Aged	92.97			

*Significant at the .05 level, when df = 215 for the t value, computed L.S.D. = 4.70

Body Cathexis Score

Means and standard deviations of body cathexis scores are reported in Table XIII. Understanding these mean scores is facilitated by recalling the five-point Likert type scale utilized in measuring body cathesix: 5 represented the most positive feeling, 3 neutrality and 1 the most negative feeling. Table XIII shows that while all age groups had positive feelings toward their bodies, the middle-aged subjects (mean = 3.64) showed slightly more positive feelings than did either of the younger subjects (mean = 3.57 for both younger age groups). Likewise, the three exercise categories produced varied responses in the subjects' degree of positiveness



Graph 2. The Plot Means of Lean Body Mass for Each of The Three Exercise Categories, by Age Group.

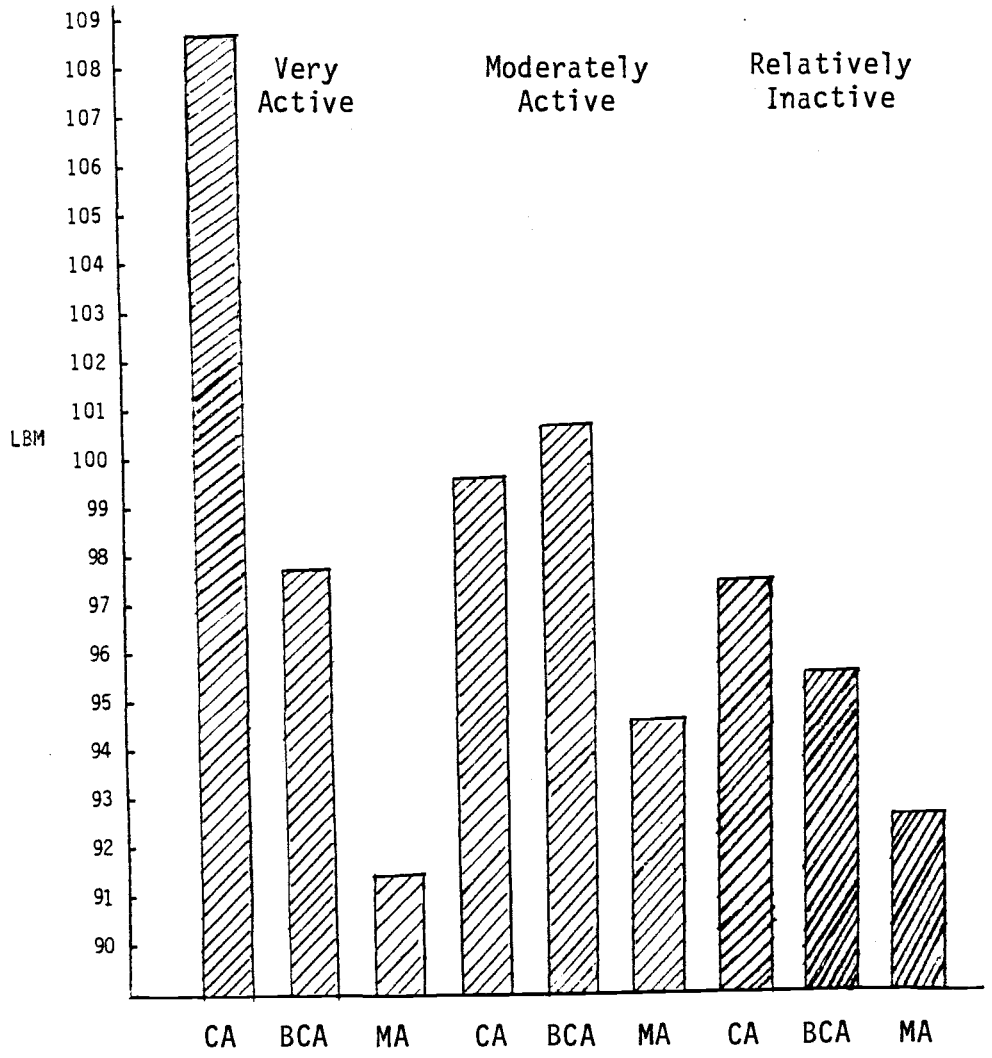


Figure 2. Mean Lean Body Mass by Age Group and Exercise Levels.

CA = College-Age

BCA = Beyond College-Age

MA = Middle-Aged

Table XIII

Means and Standard Deviations of Body Cathexis Scores for Three Age Groups in Three Exercise Categories

Group	N	Mean	S.D.
College-Age	79	3.57	.40
Very Active	31	3.71	.45
Moderately Active	21	3.61	.28
Relatively Inactive	27	3.36	.34
Beyond College-Age	73	3.57	.47
Very Active	24	3.79	.53
Moderately Active	27	3.54	.41
Relatively Inactive	22	3.36	.40
Middle-Aged	64	3.64	.46
Very Active	21	3.87	.48
Moderately Active	20	3.67	.31
Relatively Inactive	23	3.39	.44
Activity Category			
Very Active	76	3.78	.48
Moderately Active	68	3.60	.34
Relatively Inactive	72	3.38	.39
Total Subjects	216	3.59	.44

toward their bodies. The means were 3.78, 3.60, and 3.38 for the high, moderate, and low activity levels, respectively.

The two-way analysis of variance procedure was utilized to determine if there were any statistically significant differences in body cathexis scores. As reported in Table XIV, a significant

Table XIV

Analysis of Variance Table for Age and Exercise Differences in Body Cathexis

Source of Variation	df	SS	MS	F	Significance of F (P)
Age	2	.309	.155	.901	.408
Exercise	2	6.343	3.172	18.474*	.001
Interaction (Age x Exercise)	4	.214	.053	.311	.870
Error	207	35.536	.172		
Total	215	42.21	.196		

*Significant at the $p < .05$ level

difference was found to be associated with the exercise levels. The computed F value was significant at the .001 level. Thus, the null hypothesis was rejected. However, such difference among three age groups of women was not found to be significant. Hence, the second null hypothesis was retained. No interaction effect was found for this variable.

The Least Significant Difference (L.S.D.) test was used to determine whether all three of the exercise groups' means were significantly different from one another. The results are

presented in Table XV. It can be seen that the mean difference between the high

Table XV

Interpretation of L.S.D. Test for Three Exercise Categories on Body Cathexis Scores

Source	Group	Mean	Difference (subtracted)	Decision	Conclusions
Exercise Level	Very Active	3.78			
			0.18	Sig.	$M_{VA} > M_{MA}$
	Moderately Active	3.60			
			0.22*	Sig.	$M_{MA} > M_{RI}$
	Relatively Inactive	3.38			

*Significant at the .05 level, when df = 215 for the t value, computed L.S.D. = 0.17

and moderate activity levels was 0.18; the mean difference between the moderate and low activity levels was 0.22. Both of these figures were greater than the tabular value of 0.17 at the .05 level, which indicated that women who engaged in high to low levels of physical activity showed significant differences in degree of positiveness toward their bodies. Using Figure 3 to interpret these results, it is apparent that very active subjects had the most positive attitudes (mean = 3.78); the relatively inactive subjects had the least positive attitudes (mean = 3.38); and the moderately active subjects

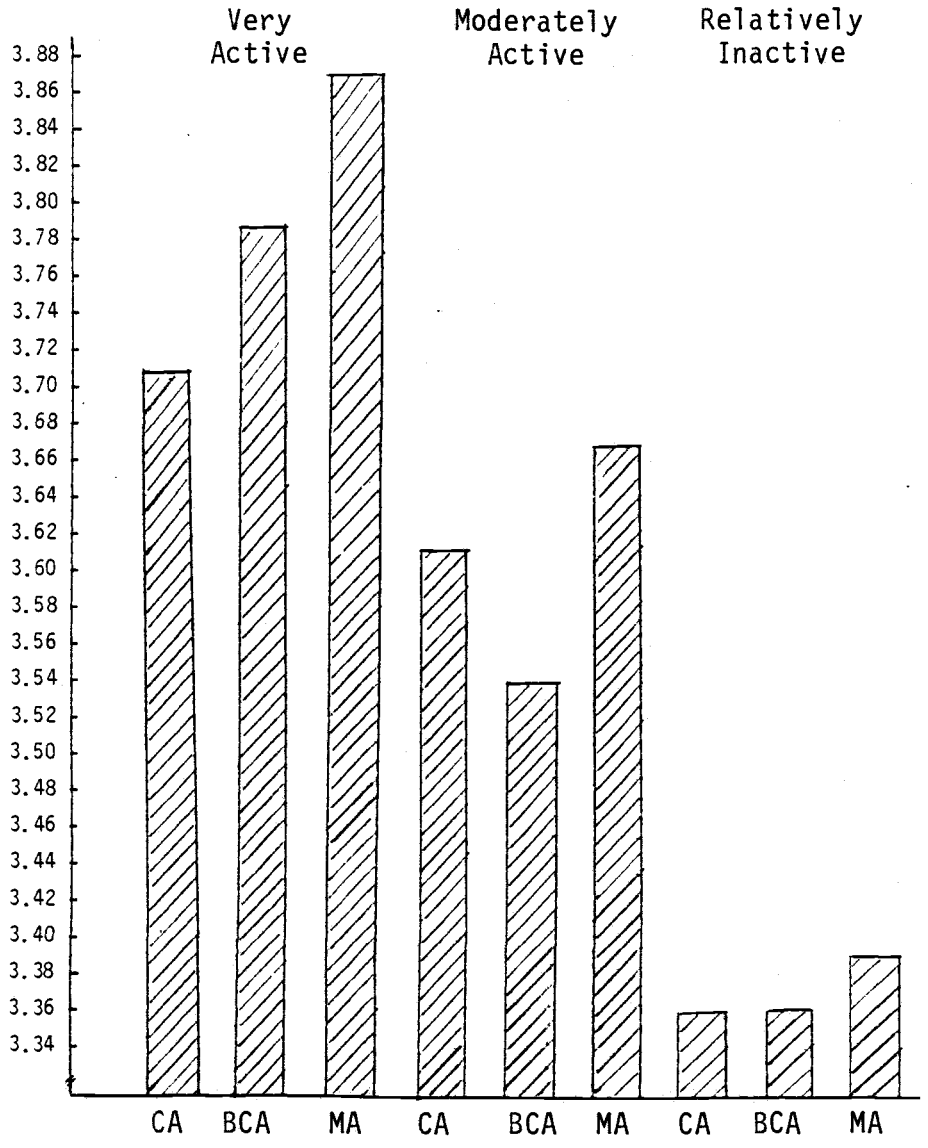


Figure 3. Mean Scores of Body Cathexis by Age Group and Exercise Level.

CA = College-Age

BCA = Beyond College-Age

MA = Middle-Aged

(mean = 3.60) fell in between the very active and relatively inactive subjects in degree of positveness toward their bodies.

Attitude Toward Obesity Score

The means and standard deviations of attitude toward obesity scores are reported in Table XVI. The Likert scale utilized in measuring obesity attitude in this study held 1 as the most positive attitude, 3 as neutral, and 5 as the most negative attitude. Given this, Table XVI shows that attitudes toward obesity were generally neutral to slightly negative for all subjects. The results of the analysis of variance procedure are presented in Table XVII. These data do not reveal any statistically significant differences for age, exercise, or age x exercise interaction effect in the subjects' attitudes toward obesity. These data indicate that women investigated in this study show similar attitudes toward obesity regardless of their age or level of physical exercise. Thus, all of the null hypotheses were retained.

Summary of Findings and Discussions

Table XVIII presents a summary of the analysis of variance results for each one of the four dependent variables in this study. It can be seen that six null hypotheses were rejected-- five related to the percentage of body fat and lean body mass, and one related to body cathexis.

Table XVI

Means and Standard Deviations of Attitude Toward Obesity Scores for Three Age Groups and Three Exercise Levels

Group	N	Mean	S.D.
College-Age	79	3.04	.35
Very Active	31	3.02	.28
Moderately Active	21	3.08	.44
Relatively Inactive	27	3.02	.36
Beyond College-Age	73	3.06	.36
Very Active	24	3.10	.32
Moderately Active	27	3.03	.38
Relatively Inactive	22	3.04	.38
Middle-Aged	64	3.08	.32
Very Active	21	3.11	.35
Moderately Active	20	3.12	.30
Relatively Inactive	23	3.01	.31
Activity Group			
Very Active	76	3.07	.31
Moderately Active	68	3.07	.38
Relatively Inactive	72	3.02	.35
Total Subjects	216	3.06	.35

Both the percentage of body fat and the amount of lean body mass were found to be significantly different for women in various age groups. The college-age subjects had the lowest percentage of body fat and the greatest amount of lean body mass. On the other hand,

Table XVII

Analysis of Variance Table for Age and Exercise Differences in Attitude Toward Obesity

Source of Variation	df	SS	MS	F	Significance of F (P)
Age	2	.057	.029	.235	.791
Exercise	2	.143	.072	.585	.558
Interaction (Age x Exercise)	4	.185	.046	.378	.824
Error	207	25.309	.122		
Total	215	25.674	.119		

the middle-aged subjects showed the opposite ratio; they had the highest percentage of body fat and the lowest amount of lean body mass.

There were two significant age x exercise interaction effects in this study. Both were found in the body composition variables. Ordinal interaction was evidenced for the percentage of body fat (%F) variable, except between exercise levels of very active and moderately active with college-age and beyond college-age women. The

Table XVIII

A Comparison of Analysis of Variance for Percentage of Body Fat, Lean Body Mass, Body Cathexis, and Attitude Toward Obesity in Three Age Groups and Three Exercise Categories

	Age					Exercise Level					Interaction	
Variable	M_{CA}	M_{BCA}	M_{MA}	Computed F	Ho Decision	$\bar{X}_{VA}$	$\bar{X}_{MA}$	$\bar{X}_{RI}$	Computed F	Ho Decision	Computed F	Ho Decision
%F	24.27	26.02	31.47	40.268	Reject	23.86	26.88	30.42	35.663	Reject	3.283	Reject
LBM	102.58	98.09	92.97	10.471	Reject	100.50	98.63	95.42	2.314	Retain	3.034	Reject
Body Cathexis	3.57	3.57	3.64	.901	Retain	3.78	3.60	3.38	18.474	Reject	.311	Retain
Obesity Attitude	3.04	3.06	3.08	.235	Retain	3.07	3.07	3.02	.585	Retain	.378	Retain

M_{CA} = mean oF College-age subjects
M_{BCA} = mean of Beyond college-age subjects
M_{MA} = mean of Middle-aged subjects

$\bar{X}_{VA}$ = mean oF very active subjects
$\bar{X}_{MA}$ = mean of moderately active subjects
$\bar{X}_{RI}$ = mean of relatively inactive subjects

pattern of interaction for the lean body mass variable showed a mixed structure of ordinal, disordinal, and nonexistent interaction condition.

The percentage of body fat and body cathexis were found to be significant for differing levels of physical exercise. Women who involved in the lowest level of physical exercise demonstrated the highest percentage of body fat and the least positive attitudes toward their bodies.

Yet, women investigated in this study did not show any variation in their attitudes toward obesity, regardless of their age or physical exercise.

Discussion of the Findings

An analysis of the subjects' reports on the physical activity history questionnaire revealed some significant differences in the degree and intensity of the physical exercise routines performed at each of the three activity levels. The majority of the very active subjects engaged in exercise more than three times a week, 45 minutes or more than one hour each time, and had maintained this pattern for more than one year. The most popular exercises performed by this group were jogging and walking.

The subjects in the moderately active level exercised either two to three times or more than three times a week for 30 to 45 minutes each time for at least the last three months prior to participation in the present study. Most of the subjects included dancing and walking in their regular exercise sessions.

The subjects in the relatively inactive level rarely exercised regularly or intensively. Nearly 1/3 of the low active subjects reported not doing any conditioning or aerobic exercise at all. The rest of the relatively inactive subjects reported having exercised two to three times, or fewer than two times a week for less than 30 minutes each time. Walking was the most popular form of exercise for these subjects. They had maintained this exercise pattern for less than three months.

Differences in exercise routines among the three exercise levels were in line with the subjects' self-rated level of activeness (Table V). The results indicate that 100% of the very active subjects perceived themselves as either very active or fairly active; 81% of the moderately active subjects thought themselves to be fairly active; and, 75% of the low active subjects rated themselves as either not too active or not active at all.

An analysis of the body composition data, including both percentage of body fat and lean body mass, revealed a significant age-related difference in the group of middle-aged women subjects. The middle-aged subjects had an average of 31.47% body fat and 92.97 pounds lean body mass, whichwere significantly different from that of both the college-age and beyond college-age subjects. A comparison of physical characteristics of these three age groups of women found that the older group was also shorter and heavier than the other two younger age groups. Additional evidence of fatness in middle-aged women could be detected from the coefficient between percentage of

body fat and body weight. A moderate but significant correlation ($r = .69$, $p < .001$) revealed that body fat was related to body weight for this age group. The greater the body fat, the higher the body weight. These findings--of these non-significant differences between college-age and beyond college-age women, along with markedly altered proportions for middle-aged women in terms of body fat percentage and lean body mass--were clearly consistent with other reports, that body fat remained constant until about 40 years of age. From then on, overall body fat increased with age (Young, et al., 1963); the amount of lean body mass declined with age (Forbes, 1976); and, the rate of declination increased in the later years (Forbes, 1976; Novak, 1972).

Such results confirm theoretical discussions in the literature which maintain that major tissues of the body undergo considerable alteration in growth and development during aging: both on the molecular level and in terms of overall body composition (Parizkova, 1963; Gary et al., 1977). Furthermore, several known physiological changes take place within these years. Functional capacities reach their peak, then deteriorate with increasing age. The consequent reduced locomotor activity subsequently leads to the accumulation of fat and declination of lean body mass (Parizkova, 1963). These biological and physiological variations, along with increasing age, cause older women to be more susceptible to fat accumulation and loss of lean body mass than their younger counterparts.

The findings of the present study clearly confirm that the percentage of body fat and lean body mass for women over 40 years of age

are significantly different from those of college-age and beyond college-age women.

The influence of physical exercise on body composition has long been investigated with various population groups. Most studies reported an increased lean body mass at the expense of fat as the result of physical training programs. A dynamic fluctuation in body composition with variation in physical activity was reported by Parizkova (1963). She indicated that during increased muscular activity the lean body mass hypertrophied and fat disappeared; and, that with substantial reduction of muscular activity muscular mass decreased slightly in size and fat accumulated. The findings of the present study confirmed the significant role of physical exercise in affecting body fat in women. Very active women had the lowest body fat, moderately active women had the next lowest figure, and the relatively inactive women showed the greatest body fat. The differences among these three exercise groups were significant at the .001 level. These results were consistent with other studies using younger subjects of both sexes. In such studies (Parizkova, 1963, 1968), the author concluded that the intensive physical training within a certain period of time resulted in a decreased body fat content.

The subjects in the high, moderate, and low level of physical activity demonstrated remarkable differences in their body fat content. These findings seem to suggest that the more strenuous and intense the physical activity involved, the less body fat would be

expected for women. Some important questions are then raised. First, how much physical activity is required to maintain appropriate body fat percentage? Second, what is the minimum physical activity needed to achieve a significant decrease in body fat for women? The complete answer to these questions is beyond the scope of the present study. Further investigation into the relationship between body fat content, and physical activity levels may provide greater insight. On the basis of the current findings which reveal that the moderately active subjects had mean body fat of 26.9%--a percentage slightly over the ideal body fat content of 25% for normal women--the investigator assumed that a moderate level of physical activity above the sedentary level is the minimum requirement necessary to induce alteration in body fat for women. In order to achieve appropriate body fat content, regular and intensive exercise will be needed.

An increase of lean body mass at the conclusion of a physical training program has been reported in many body composition studies. Parizkova (1963) reported that, when groups of adults trained and untrained in physical activity were compared, a greater proportion of lean body mass was found in the physically highly active adults than those who unaccustomed to physical activity. The differences in lean body mass among the three activity groups in the present study showed a similar trend. The very active subjects had greater lean body mass than either of the less active subjects; while the moderate active subjects showed more lean body mass than the least active

subjects. The differences among these three exercise groups, however, were not significant ($p > .05$).

A possible interpretation of these non-significant results may be that the intensity of physical activity within the very active and the moderately active categories was not sufficiently strenuous to cause the expected results. One study (Metcalfe, 1980) had indicated that improvement in an individual's fitness level came after regular and systematic practicing, with a certain degree and intensity of loading over an extended period of time. Since literature investigating the effects of lifelong physical activity on lean body mass in women is lacking, it is not possible to determine in what way the apparent ineffectiveness of habitual physical activity is responsible for the non-significant results of the present study. Further research will be needed to investigate the stability and nature of this tendency.

A second possibility assumes that the slight difference in lean body mass among the three activity groups of women is perhaps peculiar to the present sample. Most of the subjects were involved with Oregon State University as either faculty, staff, or students. A few of the subjects were members of a church group or were the members of a square dance club. Eighty percent of the subjects responded above the sedentary level regarding their occupational activity. The similarity reported in levels of physical activity required by the subjects' occupations and any impact it had on their lean body mass is unknown. A definite conclusion implied by the

present sample would require following the same subjects for a longer period of time in order to explicate the exact nature of this assumption.

The body cathexis measure among the three age groups of women in this study revealed that there was no significant difference in the degree and direction of attitude toward parts or functions of the body. All female subjects showed a similar degree of body satisfaction regardless of their age. The finding that body image was not influenced by a subject's age was consistent with the studies of Fisher (1969), Plutchik (1973), and Hammer and Wilmore (1973). It was concluded that the age variable alone did not effect any changes in women's attitudes toward their bodies.

Another finding of this study, relating to the body cathexis measure, was that women showed a significant difference in attitudes toward their bodies according to their exercise patterns. Those women who were frequent exercisers demonstrated a more positive body cathexis than did the non-exercising women. The marked influence of muscular activity on women's body cathexis was in agreement with the studies of Joesting (1981) and Joesting and Clance (1979).

The degree of participation in physical exercise has been shown to have an effect on body image (Snyder and Kivlin, 1975). The female subjects of this study who engaged in high, moderate, or low levels of physical exercise demonstrated significant differences in degree of satisfaction toward their bodies. The very active subjects had the most positive attitudes, the relatively inactive

subjects exhibited the least positive attitudes, and the moderately active subjects fell in between in degree of satisfaction toward their bodies. These findings seem to suggest that any sport or activity above the sedentary level are associated with differences in body cathexis for women. And, the more intense the physical exercise involved, the more positive will be the resultant body cathexis.

In summary, this study makes clear that age has no influence on body cathexis for women. This finding (when combined with the fact that women with lower levels of physical exercise, whether young or old, demonstrate significantly less body satisfaction than do highly active women) implies that age plays a less prominent role in women's body cathexis than does level of physical exercise. In this study, sedentary life style and inadequate physical exercise are more crucial factors in differences in body cathexis than is the decline in physical condition which accompanies normal aging.

The obesity attitude scores did not differ significantly among the three age groups, nor was there any significant difference attributable to physical activity levels. While all female subjects showed slightly negative attitudes toward obesity, the middle-aged women had the most negative attitudes, followed by the next younger age group, and lastly the college-age women who showed the least negative attitudes. The slight differences among these three age groups were not statistically significant. In comparing obesity attitudes among the three exercise categories, an interesting result

appeared. The relatively inactive women had more positive attitudes toward obesity than did either of the more active groups. Again, the differences among these three exercise groups were not statistically significant.

These findings did not provide evidence of differences in women's attitudes toward obesity due to age or exercise participation. The female subjects in this study demonstrated similar attitudes toward obesity. A possible interpretation of these results can be attributed to the subjects selected for the present sample. Earlier studies (Stunkard, 1980; Salans, 1979) had indicated a strong relationship between social factors and the prevalence of human obesity. Possible differences in attitudes toward obesity had been attributed to differing social levels (Salans, 1979). The non-significant differences in obesity attitude scores may be due to the similar socioeconomic status shared by the majority of the subjects. This may account for the findings of the present study. However, data relating to the subjects' (or their parents') socioeconomic situation are not directly collected. A definite conclusion can not be made. Future research investigating both the individual's attitudes toward obesity, and the subject's socioeconomic status is suggested by the results of the present study.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Changes in body composition that come with increasing age manifest themselves in the ratios of body fat percentage to lean body mass. The fluctuations of these two components of body composition are also closely related to variations in levels of physical activity. Spontaneous muscular activity results in more lean muscle mass and less body fat. With substantial reduction in muscular activity changes occur in reverse, with lean body mass falling sharply, while percentage of body fat markedly increases.

Prolonged regular physical activity is related to not only beneficial physiological changes, but also some positive changes in psychological well-being. There are differences in body image between those individuals who exercise regularly and those who do not. Frequent exercisers tend to have more positive feelings toward their bodies than do non-exercisers.

One of the consequences of physical inactivity is the maintenance and development of obesity in some individuals. The desire to lose weight has been confirmed to be one of the major reasons that an individual chooses to engage in some form of exercise. However, despite the many physiological and psychological benefits associated with exercise participation, there are many individuals who have

rarely exercised on any regular basis. A study designed to investigate obesity attitudes of individuals engaged in various levels of physical activity could provide some insights into the problem of obesity.

The primary purpose of this study was to identify significant differences in body composition, body cathexis, and attitudes toward obesity of women in various age groups involved in differing levels of physical activity.

A total of 216 women, ranging in age from 17 to 64, took part in this study. Most of the subjects were randomly selected from female employees and students at Oregon State University. The remaining subjects were selected from the female participants of a square dance club, a church group, and an adult exercise class. All measurements were conducted at the Human Performance Laboratory, Physical Education Department, Oregon State University during the Spring Term of 1983. All subjects filled out the Physical Activity and Body Cathexis Survey. Then the subjects submitted themselves to a series of skinfold fat measurements.

The results of the physical activity history questionnaire classified the subjects into three age groups: college-age (mean age 20.1 yrs.), beyond college-age (mean age 30.4 yrs.), and middle-aged (mean age 52.8 yrs.), and into three exercise categories: very active, moderately active, and relatively inactive.

In determining degree and direction of feelings toward conceptual parts or functions of the body, the Secord and Jourard's

Body Cathexis Scale (1953) was utilized to collect the data. Subject's responses to each of the 40 items on the scale were summed and averaged. A mean score of 5 represented the most positive feelings, 3 neutrality, and 1 the most negative feelings.

The third part of the Physical Activity and the Body Cathexis Survey investigated the subjects' attitudes toward obesity. Bray's Obesity Attitude Scale (1973) was employed. This is a Likert type scale consisting of 47 statements about obesity. Again, the subjects' responses were summed and mean scores calculated. High scores (greater than 3) indicated a negative attitude toward obesity, and lower scores (less than 3) indicated a positive attitude.

The prediction equation developed by Jackson et al. (1980) for determining body density was used. The formula was:

$BD = 1.0994921 - 0.0009929(X_3) + 0.0000023(X_3)^2 - 0.0001392(X_2)$,

where X_2 = age, and X_3 = the sum of three skinfolds.

The measurements were taken at triceps, thigh, and suprailium skinfolds on the right hand side of the body. Three observations for each site were made and an average computed. The percentage of body fat data was then derived from Siri's formula (1961) in which $\%F = [4.95/BD - 4.5]$.

Lean body mass was obtained by subtracting fat weight from total body weight. Thus, LBM = body weight - (body weight x %F).

The Two-Way Analysis of Variance was computed to determine if any significant differences existed among the three exercise levels and the three age groups for the variables studied. The .05 level of

significance was adopted to determine whether to reject or retain each of the null hypotheses.

Conclusions

Based on the results of the statistical analysis of variances for the four dependent variables in this study, the following conclusions have been drawn:

1. There was a significant difference between the body composition of beyond college-age women (age 25-39 yrs) and middle-aged women (age 40-64 yrs). The middle-aged subjects showed a higher percentage of body fat and lower lean body mass than the beyond college-age subjects. There was, however, no significant difference between the body composition of the college-age and the beyond college-age subjects. These findings confirm that body fat remains constant until about 40 years of age, then body fat content increases with age. The amount of lean body mass shows an age-related decline, and the rate of declination is marked after the age of 40.
2. Different levels of physical activity performed by women had significant effects on their body fat percentage. Women in the very active level showed the least amount of body fat, followed by those in the moderately active

level; and lastly, women in the relatively inactive level showed the greatest amount of body fat.

3. There was no significant difference in lean body mass at each of the three exercise levels. Women investigated in this study had similar amounts of lean body mass regardless of their levels of exercise participation.
4. There was significant interaction effect of age and exercise level in women's percentage of body fat and lean body mass. The pattern of interaction for the percentage of body fat variable showed a structure of ordinal and nonexistent interaction condition. The interaction pattern for the lean body mass variable presented a mixed structure of ordinal, disordinal and nonexistent condition.
5. The levels of physical activity had a significant effect on the body cathexis of women. The very active women showed the most positive feelings. The moderately active women ranked next in degree of positiveness toward their bodies, and the relatively inactive women had the least positive feelings. These findings revealed that the more vigorous and intense an exercise pattern, the more positive were associated with body attitudes.
6. There was no significant difference in the body cathexis of women in the three age groups. All female subjects,

whether young or old, showed a similar degree of satisfaction toward their bodies. The body cathexis of women was uninfluenced by age.

7. The differences in attitudes toward obesity between women, young or old, exercising or not exercising, were not significant. Women's obesity attitudes were not affected by either age or levels of exercise.

Recommendations for Future Studies

After analyzing the findings of this study, the investigator presents the following recommendations for future research:

1. A study similar to the present one should be conducted with a broader cross-sectional sample to determine the consistency of the results.
2. A study similar to the present one should be conducted with older aged male and female subjects.
3. A study should be conducted to clarify the possible impact of the level of occupational activity on the body composition of women.
4. A study should be conducted to further define the intensity of exercise required to achieve ideal body fat content for women.
5. A study similar to the present one, but following the subjects over a prolonged period of time should be

conducted in order to compare the results with the current findings.

6. A study should be conducted to identify what types of exercise most influence an individual's body composition and body cathexis.
7. A study should be conducted to identify what factors contribute to differences in an individual's attitudes toward obesity.

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APPENDICES

APPENDIX A

The Department of Physical Education

Oregon State University

Corvallis, Oregon 97331-3302

07 April 1983

Mr. Duane Faulhaber
Record & Information
Systems Manager
Office of Budgets
Ads A 510
Oregon State University

Dear Mr. Faulhaber:

I am a graduate student in Physical Education Department at Oregon State University. At present, I am in a process of selecting subjects and collecting data for my doctoral dissertation - "A Comparison of Body Composition, Body Cathexis, and Attitude Toward Obesity in College Women and Middle Aged Women with Different Level of Physical Activity". The purpose of my study is to identify the body composition, body image, and attitude toward obesity among 18 to 64 year old women. Subjects for the study will be randomly drawn from two selected groups of women: (1) female students who are currently enrolled at Oregon State Univeristy, and (2) women who are employed at Oregon State University as faculty or staff during the Spring term, 1983.

I was informed by the Survey Research Center of Oregon State University that your office is helpful in regard to the recruitment of subjects in research projects.

I would appreciate your assistance and am looking forward to meeting with you in the near future.

Sincerely,

Mary Lai
Doctoral Candidate
Women's Building #206
Tel: 754-3266
Oregon State University

Arnold Flath, Professor
Chairman of Doctoral Committee
Oregon State University

APPENDIX B

A research study is being conducted by a doctoral student in the Physical Education Department at Oregon State University. Female volunteers, between 18 and 64 years of age are needed to participate. Volunteers will be asked to provide information regarding their exercise habits, their body image and their attitudes toward obesity. Body composition will also be estimated by either the use of calipers or underwater weighing techniques.

All tests will be individually arranged to meet the participant's time schedule.

Contact Mary Lai, doctoral candidate, at 754-3266 or 758-4074 after 6 pm for more information or to indicate your willingness to participate.

APPENDIX C

CONSENT FORM

I, _____, give my consent to participate in the study - A Comparison of Body Composition, Body, Cathexis, and Attitude Toward Obesity in Women with Different Level of Physical Activity. The study has been explained to me and all my questions have been answered. I agree to complete the physical activity and body image survey. I also agree to participate in the body composition measurement using either the skinfold fat measurement or the underwater weighing technique. I understand that by participating in this study there are no risks or benefits to me. I am free to withdraw from the study at any time. I also understand that the investigators reserve the right to withdraw me from this study at any time.

All information concerning me will be kept confidential.

_____

Signature Date

APPENDIX D

PHYSICAL ACTIVITY AND BODY CATHEXIS SURVEY

1. Do you do any conditioning or aerobic exercise? (aerobic exercise includes: jogging, walking, swimming, dancing, jumping rope, etc.) (Circle one number)

   1 NO (Please go to Question #5)
   2 YES

   1a. How often do you do conditioning or aerobic exercise? (Circle one number)

   1 LESS THAN TWICE PER WEEK
   2 TWO TO THREE TIMES PER WEEK
   3 MORE THAN THREE TIMES PER WEEK
   4 OTHER (Specify _____)

   1b. For those days that you exercise, which one of the following best describes the total amount of time you spend exercising? (Circle one number)

   1 LESS THAN THIRTY MINUTES
   2 THIRTY TO FORTY-FIVE MINUTES
   3 MORE THAN FORTY-FIVE MINUTES BUT LESS THAN ONE HOUR
   4 ONE HOUR OR MORE

   1c. How long have you maintained this current pattern of exercising? (Circle one number).

   1 LESS THAN THREE MONTHS
   2 THREE MONTHS TO FIVE MONTHS
   3 SIX MONTHS TO ONE YEAR
   4 MORE THAN ONE YEAR

2. Thinking now about the type of exercise you have been doing, please indicate whether you do the following exercises often, occasionally, rarely, or never? (Circle one number foreach)

	OFTEN	OCCASIONALLY	RARELY	NEVER
a. Jogging	1	2	3	4
b. Swimming	1	2	3	4
c. Dancing	1	2	3	4
d. Bicycling	1	2	3	4
e. Weight lifting	1	2	3	4
f. Walking	1	2	3	4
g. Calisthenics	1	2	3	4
h. Trampoline.	1	2	3	4
i. Other (Specify_____)	1	2	3	4

(PLEASE TURN THE PAGE)

3. Indicate whether or not each of the following is a factor in determining when you stop your exercise workout. (Circle one number for each)

	YES A FACTOR	NO, NOT A FACTOR
a. Time involved	1	2
b. Distance traveled	1	2
c. Feeling of becoming tired	1	2
d. Other (Specify _____). .		

4. Generally, do you monitor or measure your heart rate when exercising? (Circle one number)

1 NO
2 YES → 4a. About how many beats per minute is your heart rate during exercising?

_____ BEATS PER MINUTE

The following questions are designed to help me interpret the results more accurately. I would very much appreciate your answers to these questions.

5. Considering your age and height, do you think you are overweight, underweight, or about right? (Circle one number)

1 OVERWEIGHT
2 UNDERWEIGHT
3 ABOUT RIGHT

6. How satisfied or dissatisfied are you with your current physical condition? (Circle one number)

1 VERY SATISFIED
2 SATISFIED
3 NEITHER SATISFIED NOR DISSATISFIED
4 DISSATISFIED
5 VERY DISSATISFIED

7. Considering your age and daily activities (including occupational and non-occupational activities), how active do you feel you are? (Circle one number)

1 VERY ACTIVE
2 FAIRLY ACTIVE
3 NOT TOO ACTIVE
4 NOT ACTIVE AT ALL

(GO ON TO NEXT PAGE)

8. Please indicate whether or not you have had a rapid weight loss during the past six months. (Circle on number)

   1 NO
   2 YES

   → 8a. In what month did this rapid weight loss occur?

   _____ Month

   8b. About how many pounds did you lose?

   _____ Pounds

9. Which one of the following best describes the level of activity required in your current occupation? (Circle one number)

   1 Predominately sedentary--setting position (desk worker, typist, etc.)

   2 Light activity--some standing and walking (cashier, student, general office work, librarian, etc.)

   3 Moderate activity--walking and material handling (waiter, waitress, mail carrier, etc.)

   4 Heavy activity--heavy manual labor (construction laborer, farm laborer, gardener, etc.)

   5 Other (Specify _____)

10. In what year were you born? (Circle one number)

   1 Before 1919

   2 1919 - 1943

   3 1944 - 1958

   4 1959 and after

(PLEASE TURN THE PAGE)

4

The following inventory consists of 40 items designed to sample your degree of satisfaction toward various parts of your body. There are no right or wrong answers. What is wanted is your own personal feeling about each given body part. Read each item and decide how you feel about it. Then circle your number provided to the right of the word phrases.

BE SURE TO RESPOND TO EVERY ITEM

Mark	1	2	3	4	(5)	if you have strong positive feeling
	1	2	3	(4)	5	if you have moderately positive feeling
	1	2	(3)	4	5	if you have no feelings one way or the other
	1	(2)	3	4	5	if you have moderately negative feeling
	(1)	2	3	4	5	if you have strong negative feeling

	ITEMS	STRONG POSITIVE FEELING	MODERATELY POSITIVE FEELING	NO FEELING	MODERATELY NEGATIVE FEELING	STRONG NEGATIVE FEELING
11.	Hair	5	4	3	2	1
12.	Facial complextion . .	5	4	3	2	1
13.	Appetite	5	4	3	2	1
14.	Hands	5	4	3	2	1
15.	Distribution of hair (over body)	5	4	3	2	1
16.	Nose	5	4	3	2	1
17.	Physical stamina . . .	5	4	3	2	1
18.	Elimination.	5	4	3	2	1
19.	Muscular strength. . .	5	4	3	2	1
20.	Waist	5	4	3	2	1
21.	Energy level	5	4	3	2	1
22.	Back	5	4	3	2	1
23.	Ears	5	4	3	2	1
24.	Age	5	4	3	2	1
25.	Chin	5	4	3	2	1
26.	Body build	5	4	3	2	1
27.	Profile	5	4	3	2	1
28.	Height	5	4	3	2	1
29.	Keeness of senses . .	5	4	3	2	1
30.	Tolerance of pain . .	5	4	3	2	1

(GO ON TO NEXT PAGE)

	ITEMS	STRONG POSITIVE FEELING	MODERATELY POSITIVE FEELING	NO FEELING	MODERATELY NEGATIVE FEELING	STRONG NEGATIVE FEELING
31.	Width of shoulders . .	5	4	3	2	1
32.	Arms	5	4	3	2	1
33.	Chest	5	4	3	2	1
34.	Appearance of eyes . .	5	4	3	2	1
35.	Digestion	5	4	3	2	1
36.	Hips	5	4	3	2	1
37.	Resistance to illness.	5	4	3	2	1
38.	Legs	5	4	3	2	1
39.	Appearance of teeth .	5	4	3	2	1
40.	Sex drive	5	4	3	2	1
41.	Feet	5	4	3	2	1
42.	Sleep	5	4	3	2	1
43.	Voice	5	4	3	2	1
44.	Health	5	4	3	2	1
45.	Sex activities	5	4	3	2	1
46.	Knees	5	4	3	2	1
47.	Posture	5	4	3	2	1
48.	Face	5	4	3	2	1
49.	Weight	5	4	3	2	1
50.	Sex organs	5	4	3	2	1

(PLEASE TURN THE PAGE)

Some statements often made about obesity are listed below. Please indicate how strongly you agree or disagree with each one. There are no right or wrong answers so please indicate your opinion concerning <u>each</u> statement.

	STATEMENT	AGREE STRONGLY	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	DISAGREE STRONGLY
51.	The sight or idea of an obese individual is repulsive . . .	5	4	3	2	1
52.	"Fatty" and "chubby" are acceptable terms among friends	5	4	3	2	1
53.	Most obese individuals have very little ambition	5	4	3	2	1
54.	The obese are just as valuable citizens as any other group .	5	4	3	2	1
55.	Having to sit next to an obese person is a rather uncomfortable experience	5	4	3	2	1
56.	I would prefer that my son or daughter not date an obese person	5	4	3	2	1
57.	All other things being equal, I would select the non-obese person rather than the obese to be on my committee	5	4	3	2	1
58.	Watching an obese person pick up a dropped object is humerous	5	4	3	2	1
59.	Obesity is an individual problem	5	4	3	2	1
60.	The obese are more likely to suffer from emotional disturbances than the non-obese . .	5	4	3	2	1
61.	Fat people are lazy	5	4	3	2	1
62.	Slender, thin people are healthier people than fat people	5	4	3	2	1
63.	Fat people are jolly people .	5	4	3	2	1
64.	Obese individuals exercise less than non-obese individuals	5	4	3	2	1
65.	Thin people are more popular than fat people	5	4	3	2	1
66.	Fat people enjoy life more than thin people	5	4	3	2	1

(GO ON TO NEXT PAGE)

	STATEMENT	AGREE STRONGLY	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	DISAGREE STRONGLY
67.	All things being equal, I would hire a thin person rather than a fat person. . .	5	4	3	2	1
68.	Fatness in older people is more acceptable than in younger people	5	4	3	2	1
69.	Non-obese people are more likely to be depressed than obese people	5	4	3	2	1
70.	Non-obese workers are more efficient than obese workers.	5	4	3	2	1
71.	Most obese people could lose weight if they really wanted to	5	4	3	2	1
72.	Most obese youngsters play fewer active games than non-obese youngsters	5	4	3	2	1
73.	Disturbed family relationhips may cause obesity	5	4	3	2	1
74.	Excessive size is a serious social handicap for many obese children	5	4	3	2	1
75.	The obese child is likely to be considered as a "mama's" girl.	5	4	3	2	1
76.	All an obese person needs to do is to lose weight.	5	4	3	2	1
77.	Motivation is important in achieving and maintaining proper body weight	5	4	3	2	1
78.	A fat baby is a healthy baby.	5	4	3	2	1
79.	Obese people take little pride in the way they dress .	5	4	3	2	1
80.	Less emphasis should be placed on obesity as a significant nutritional problem	5	4	3	2	1

(PLEASE TURN THE PAGE)

	STATEMENT	AGREE STRONGLY	AGREE	NEITHER AGREE NOR DISAGREE	DISAGREE	DISAGREE STRONGLY
81.	Most obese people don't see themselves as being as fat as other people see them . . .	5	4	3	2	1
82.	Feelings of inferiority might cause a person to over-eat . .	5	4	3	2	1
83.	Obese youngsters tend to be passive and withdraw from group activities	5	4	3	2	1
84.	The obese person is as socially acceptable as the non-obese person	5	4	3	2	1
85.	Obese individuals are not very pleasant to look at . . .	5	4	3	2	1
86.	A person's weight is his own business	5	4	3	2	1
87.	There are a few exceptions, but in general obese people are pretty much alike.	5	4	3	2	1
88.	Obese individuals have a lower opinion of themselves than do non-obese individuals	5	4	3	2	1
89.	Non-obese people are more dependable than obese . .	5	4	3	2	1
90.	Obese people enjoy food more than non-obese people . .	5	4	3	2	1
91.	Obesity should be treated as a disease	5	4	3	2	1
92.	Obesity can make a negative effect on a person's mental welfare	5	4	3	2	1
93.	I would rather have a non-obese spouse than an obese spouse	5	4	3	2	1
94.	Obese individuals eat more when they are emotionally upset	5	4	3	2	1
95.	Obese individuals sleep more than non-obese individuals .	5	4	3	2	1
96.	Obese individuals have little will power and self-control	5	4	3	2	1
97.	Most obese people enjoy being the object of humor. . .	5	4	3	2	1

(THANK YOU FOR YOUR COOPERATION)

APPENDIX E

ANATOMICAL LANDMARKS FOR SKINFOLD FAT MEASURES

Triceps, vertical fold on the posterior mid-line of the upper arm (over triceps), halfway between the acronomion and olecranon processes with the elbow extended and relaxed.

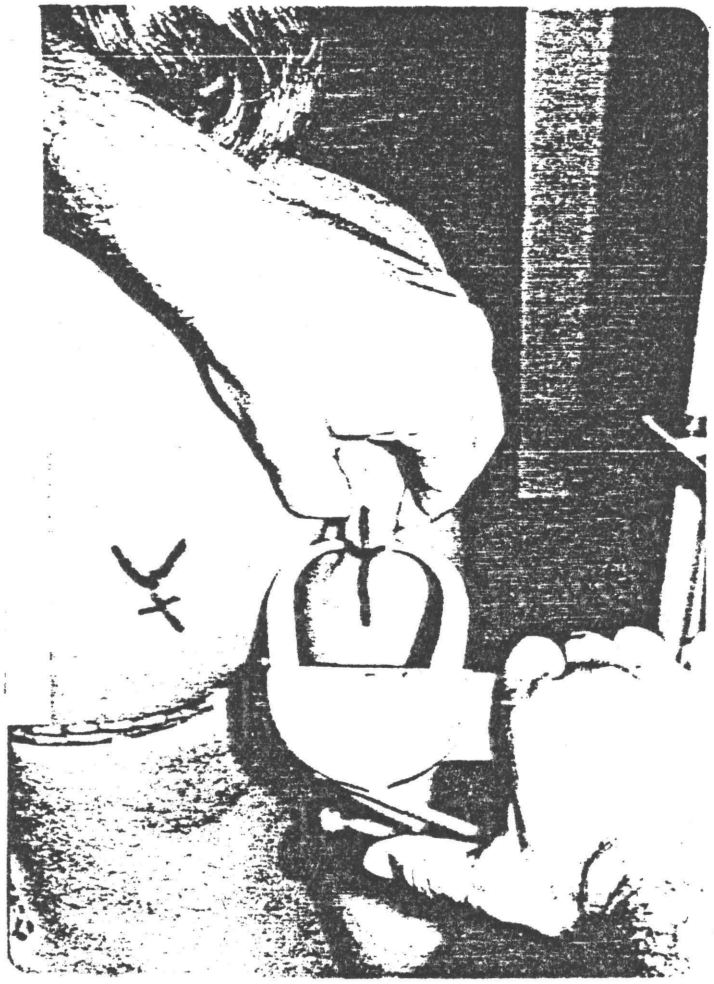
Suprailium, diagnoal fold on the crest of the ilium at the anterior axilliary line.

Thigh, vertical fold on the anterior aspect of the thigh midway between the thigh and knee joints.

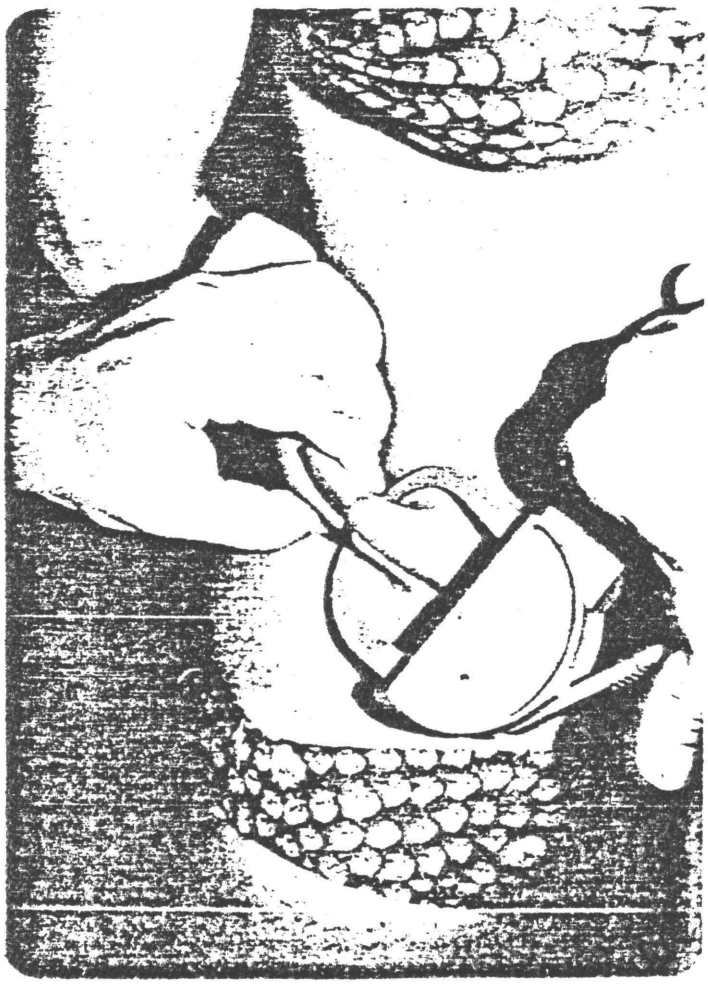
APPENDIX F

SKINFOLD FAT SITES AND CALIPER PLACEMENT

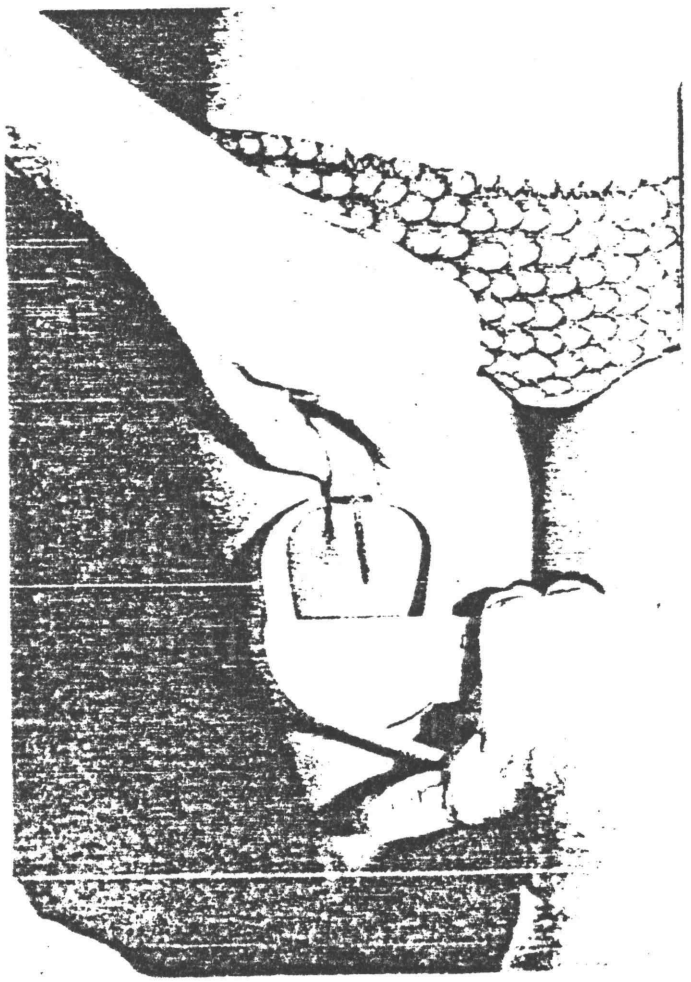
Triceps



Suprailium



Thigh



APPENDIX G

Lai, Mary
Women's Bldg.

BODY COMPOSTION MEASUREMENT DATA SHEET

Subject's Name_____ Date_____
Last First

Age_____ Weight_____ lbs._____ kg.

Height_____ in. _____ cm.

Address_____ Telephone_____

SKINFOLD THICKNESS:

						Mean*
Triceps	_____	_____	_____	_____	_____	_____
Suprailiac	_____	_____	_____	_____	_____	_____
Thigh	_____	_____	_____	_____	_____	_____
	_____	_____	_____	_____	Sum of 3	_____
	_____	_____	_____	_____		_____

CALCULATED VALUES FROM SKINFOLDS:

D_B _____ Percent Fat _____ Fat Weight _____ lbs.

Lean Body Mass_____ lbs. Optimal Weight_____ lbs.

Based on _____% body fat.

Other Information: _____

_____

_____

* Mean of three measures that meet the accuracy of <2mm difference.

APPENDIX H

The Department of Physical Education

Oregon State University

Corvallis, Oregon 97331-3302
Women's building 120

April 20, 1983

Dear

I am very pleased to give you the following information regarding the results of your body composition measurements which were taken on _____ at the Human Performance Laboratory, Oregon State University.

Skinfold Measurements

Percent Fat _____%

Fat Weight _____lbs.

Lean Body Mass _____lbs.

Optimal Weight _____lbs. Based on ____% body fat.

Underwater Weight Measurements

Percent Fat _____%

Fat Weight _____lbs.

Lean Body Mass _____lbs.

Optimal Weight _____lbs. Based on ____% body fat.

If you have any questions regarding the above, I will be very happy to discuss it with you.

Sincerely yours,

Mary Law
Graduate Student

mv

APPENDIX I

The Department of Physical Education

Oregon State University

Corvallis, Oregon 97331-3302
Women's Building 120

1983

Dear

I am very pleased to give you the following information regarding the results of your body composition measurements which were taken on _____ at the Human Performance Laboratory, Oregon State University.

Skinfold Measurements

Percent Fat _____%

Fat Weight _____lbs.

Lean Body Mass _____lbs.

Optimal Weight _____lbs. Based on ____% body fat.

If you have any questions regarding the above, I will be very happy to discuss it with you.

Sincerely yours,

Mary Lai
Graduate Student

mv

APPENDIX J

RAW DATA

Card 1

Column No.	
1-3	ID Number
4	Card Number
5-6	Percentage of Body Fat
7-37	Habitual Physical Exercise Survey
38-77	Body Cathexis Scale Responses

Card 2

Column No.	
1-3	ID Number
4	Card Number
5-51	Attitude Toward Obesity Scale Responses
52-53	Age
54-56	Height (inches)
57-60	Weight (pounds)

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