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An appraisal of the current physical fitness status of Lee College faculty, administration, and staff

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An Appraisal of the Current Physical Fitness Status of Lee College Faculty, Administration, and Staff

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An Appraisal of the Current Physical Fitness Status of Lee College Faculty, Administration, and Staff

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DEDICATION

This author owes much to many and everything to a few. This doctoral dissertation is dedicated to six individuals who made everything possible. First, to my parents, John and Carolyn Wickam, who taught me to work hard to fulfill my dreams and whose concern and support were constant, unflinching, and loving. Secondly, to my in-laws, Dr. and Mrs. Robert Fisher, who encouraged me by word and deed throughout this study. In addition to these four, two others were my greatest sources of strength and energy. To my wife, Lorri, who on a daily basis gave me the determination and inspiration to complete this project. Without her, I would now and forevermore be ABD. Lastly, and most importantly, I dedicate this dissertation to my Heavenly Father. He is the Source of my strength and is, after all, the Author of all knowledge.

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ABSTRACT

An Appraisal of the Current Physical Fitness Status of Lee College Faculty, Administration, and Staff

Charles Mark Wickam

The purpose of this study was to determine and appraise the current physical fitness levels of higher education professionals in a selected college population. The 75-member male and female faculty, administration, and staff members were measured using the following physiological variables: cardiorespiratory function, percent body fat, total cholesterol level, resting blood pressure, resting heart rate, muscular strength, and flexibility. In addition, a written health and well-being questionnaire was completed by each subject. All data were reported as means, standard deviations, and percentages on a descriptive basis, using norms and ratings from authoritative and respected sources.

The sample population was within normal or average ranges for percent body fat, blood pressure, resting heart rate, and flexibility. The subjects measured below-average cardiorespiratory function, fair muscular strength, and borderline-high cholesterol levels. Additionally, the health and well-being self-appraisal scores were in the good range.

CHAPTER 1

Introduction

Many Americans are suffering from a "disease of the lifestyle." The major cause of this "disease" is not a virus or bacteria; rather, it is caused primarily by neglect. Ardell (1981) labels this as a "disease of choice" (p. 5). Modern technology and advances, such as television, automobiles, elevators, and fast food, have caused many Americans to drive even short distances to the office or workplace, walk past stairways to ride easily to upper levels, and spend many hours each year sitting before a television--often while eating their favorite snack food.

> At the beginning of the twentieth century, the most common health problems in the United States were such infectious diseases as tuberculosis, diphtheria, influenza, kidney disease, polio, and other diseases of infancy. Progress in the field of medicine has allowed for elimination of these diseases. Nevertheless, as the American people started to enjoy the so-called "good life" (sedentary living, alcohol, fatty foods, excessive sweets, tobacco, drugs, etc.), a parallel increase was seen in the incidence of chronic diseases such as hypertension, coronary heart disease, atherosclerosis, strokes, diabetes, cancer, emphysema, and cirrhosis of the liver. (Hoeger, 1991, p. 1)

Even though this "good life" has often caused a decrease in personal exercise and health self-care, the human body's need for these critical essentials has not declined. The concept of vigorous and consistent exercise, proper eating habits, adequate self-care, and normal psychological

functioning is often referred to as overall physical fitness and ideally is not altered or affected by the "good life."

> Physical fitness means that the organic systems of the body are healthy and function efficiently so as to enable the fit person to engage in vigorous tasks and leisure activities. Beyond organic development, muscular strength, and stamina, physical fitness implies efficient performance in exercise or work and a reasonable measure of motor skill in the performance of selected physical activities. (Prentice & Bucher, 1988, p. 9)

Professionals in higher education have a definite need for proper levels of personal physical fitness. Groves (1973) states that "most college and university faculty members range in age from 25 to 65, the age range of vulnerability to premature heart disease in the United States" (p. 76). Plowman and Bischoff (1985) describe eight areas of job-related stress that often influence teachers. These include poor relationships, feelings of powerlessness and responsibility, role conflicts, and problems dealing with institutional practices and policies and growing public criticisms of teachers and schools. Austin and Pilat (1990) write that "a tremendous source of stress is to balance academic responsibilities that know no bounds with personal lives that deserve adequate attention" (p. 38) and that questions of tenure, research productivity, and fiscal pressures increase the tension felt in college and university settings. They do recommend, however, that an effective course in dealing with this problem is "following

a regular exercise program and a proper diet for general health" (Austin & Pilat, 1990, pp. 41-42).

> Another important aspect of the physical fitness issue is its relation to [teacher] effectiveness. That is, are counselors or teachers better or worse in their professional functioning because of their level of physical fitness? This puts the issue in a very important professional context. . . . Our collective common sense assessment is that sustained high quality counseling or teaching requires high levels of physical fitness. Each of us can personalize this question by asking ourselves how physically fit we need to be in order to be a good parent, spouse, citizen and so forth. It seems that one component of effectiveness is physical endurance. (Aspy, Roebuck, & Aspy, 1983, pp. 117-118)

Blair, Tritsch, and Kutsch (1987) state:

> The faculty and staff of most school districts have health problems similar to the rest of the population. Hypertension, obesity, cigarette smoking, and sedentary living habits are common and premature mortality especially in men is a major problem. Since school districts usually provide medical care benefits, costs due to premature illness and death are borne by the district (institutions). Coupled with the direct cost of health insurance are the indirect or hidden costs of absenteeism, disability, turnover, decreased productivity, and faculty and staff recruitment/replacement costs. (p. 469)

Corbin and Lindsey (1991) divide physical fitness into the five categories of body composition, cardiovascular fitness, muscular endurance, muscular strength, and flexibility. This study examined and appraised four of these five components of physical fitness, as well as resting heart rate, resting blood pressure, and cholesterol level as they pertained to male and female college faculty, administration, and staff. In addition, TestWell, a

written, self-scored, self-appraisal questioned the participant in 10 separate areas of general health and fitness.

Statement of the Problem

This study was conducted to determine, describe, and appraise, through written health appraisal and physiological testing, the current physical fitness level of male and female Lee College faculty, administration, and staff.

Purpose of the Study

This study determined and appraised the current physical fitness level of higher education professionals in a selected college population. In addition, it emphasized to each participant, through test data and personal discussion, the importance of obtaining a proper level of personal physical fitness and the benefits of maintaining that level throughout his or her professional career and lifetime. Gettman (1988) clearly summarizes the need for this type of fitness testing by stating:

> Periodic testing of health-related fitness shows the participants how they stand relative to normal fitness levels. The results can then be used to emphasize the importance of having an active lifestyle to achieve and maintain high levels of cardiovascular and respiratory function, low amounts of body fat, sufficient muscular strength and endurance, and flexibility, especially in the lower trunk and posterior thigh areas for a healthy back. Results from fitness tests should be viewed as the means to an end and not as an end in themselves. The results from fitness tests should be used in the exercise prescription. They give a picture (snapshot) of present health and fitness status and can be motivators for

> improvement and reinforcers for fitness maintenance. (p. 161)

This study provided for each subject an examination and appraisal of his or her current levels of physical fitness. Further, this study endeavored to either create or enrich in each participant a special interest and involvement in how these areas can be improved and why maintaining proper fitness levels for their lifetime is of great personal importance--both to them and to their families.

Assumptions

There are two basic assumptions related to this study. These are:

1. All subjects followed the researcher's instructions, that is, fasting, pre-exercise rest, and abstention from exercise on test day.

2. All subjects were truthful in all written and/or oral answers and responses.

Delimitations of the Study

The subjects involved in this study were from one geographical location and one population within that location.

The study used cardiorespiratory function, percent body fat, total cholesterol level, resting blood pressure, resting heart rate, muscular strength, flexibility, and TestWell to appraise participants' physical fitness.

The study is delimited by using those eligible members of the population who volunteered to participate, and furthermore, only those volunteers who were medically capable of physical fitness testing were included.

No attempts were made to monitor or control the external lifestyles of the subjects other than the distributed requested instructions.

Definition of Terms

Auscultation--the act of listening for sounds within the body for evaluation, usually performed with a stethoscope.

Blood pressure--the force exerted by blood against the wall of a blood vessel, usually measured in millimeters of mercury (mm Hg).

1. Systolic blood pressure--the force exerted against the vessel wall during the systole (contraction of the heart) phase; the top number in a blood pressure reading.

2. Diastolic blood pressure--the force exerted against the vessel wall during the diastole (relaxation of the heart) phase; the bottom number in a blood pressure reading.

Body composition--a comparison of the proportions of body fat and lean body mass.

Cardiorespiratory function--the ability of the lungs, heart, and blood vessels to deliver adequate amounts of oxygen to the cells to meet the demands of prolonged

physical activity; also termed cardiorespiratory fitness or endurance.

Cholesterol--a white, waxy, fat-like compound found in animal tissues that is constantly produced by the body, mainly by the liver and kidneys (total cholesterol or TC); measured in milligrams per deciliter (mg/dl).

1. High-density lipoprotein (HDL)--a specific kind of cholesterol found in the blood that is involved in carrying fats from the blood to the tissues, thought to be protective against heart disease--the "good" type of cholesterol; measured in milligrams per deciliter (mm/dl).

2. Low-density lipoprotein (LDL)--a specific kind of cholesterol, known to be the major cholesterol carrier in the blood and a cause of atherosclerosis--the "bad" type of cholesterol; measured in milligrams per deciliter (mg/dl).

Faculty, administration, and staff--full-time employees with responsibility as faculty, administrators, professional staff, or a combination of more than one of these areas; recompense must be on a salary basis and not on an hourly rate.

Flexibility--the ability or functional capacity of a joint or group of joints to move through their full range of motion.

Heart rate--the number of contractions of the heart per unit of time, expressed in beats per minute (bpm).

Muscular strength--the maximal one-effort force that can be exerted against a resistance.

Palpation--to examine or measure by touch.

Percent body fat--the percentage of overall body weight that is composed of fat.

Physical fitness--the ability to carry out daily tasks normally, without becoming too tired and with energy left to meet emergencies or to enjoy leisure activities; contains five components: cardiovascular function, body composition, flexibility, muscular strength, and muscular endurance.

Sphygmomanometer--a device for measuring blood pressure. It consists of a cuff, tube, bulb, and a gauge for showing the amount of air pressure being pressed against the artery.

Step test--a test which involves stepping up and down on a 12-inch bench in rhythm with a metronome for a definite unit of time.

Stethoscope--an instrument which uses a diaphragm placed against the skin to hear internal sounds of the body.

Submaximal test--an exercise test that is terminated at an exercise intensity before subject exhaustion.

TestWell--a written, self-scored, self-appraisal distributed by the National Wellness Institute (1988); the test surveys the 10 separate, yet related areas of the subjects' physical fitness, nutrition, self-care, drugs and driving, social choices, emotional awareness, emotional

control, intellectual efforts, occupational feedback, and spiritual aspects of their lifestyles.

Questions to be Answered

The following questions were researched as they relate to the sample population, the faculty, the administration and staff, both sexes, and the seven sex-age groups:

1. What is the level of cardiorespiratory function of the subjects?

2. What is the percentage of body fat for the subjects?

3. What is the total blood cholesterol level for the subjects?

4. What are the resting systolic and diastolic blood pressures of the subjects?

5. What is the resting heart rate of the subjects?

6. What is the muscular strength to body weight ratio for the subjects?

7. What is the flexibility of the subjects?

8. What is the score on TestWell, the written, self-appraisal for the subjects?

CHAPTER 2

Review of Related Literature

The review of related literature is divided into eight main categories. There is a review for each of the physiological tests and an additional review for TestWell, the written self-appraisal. The focus of each of these categories is twofold. First, data are presented from experts in their individual fields as to what they believe to be the advisable or acceptable level of fitness or function. Second, available studies pertaining to similar populations that determined the actual levels of fitness or function are reviewed. In short, this review establishes what the literature reveals the levels should be and what the actual levels were in similar sample populations.

According to the American Heart Association (1989), coronary artery disease remains the number one cause of death and disability in the United States, responsible for more than 500,000 deaths each year. In 1987, heart and blood pressure diseases killed nearly 1,000,000 Americans--almost as many as cancer, accidents, pneumonia, influenza, and all other causes of death combined. Nearly one-fifth of all people killed by cardiovascular disease are under age 65. On the average, almost three Americans will suffer a heart attack every minute of the day, adding up to

almost 1,500,000 attacks each year. Someone dies from cardiovascular disease every 32 seconds.

In its booklet, 1990 Heart and Stroke Facts, the American Heart Association (1989) lists heredity, male gender, increasing age, smoking, high blood pressure, and elevated blood cholesterol as the major risk factors of cardiovascular disease. The contributing factors are diabetes, obesity, physical inactivity, and stress. This study addressed these factors by examining and appraising each subject's physical fitness levels and by discussing his or her lifestyle with each participant. It is an intended purpose of the study to help each subject become more cognizant of the risk factors evident in his or her life and the correlation between cardiovascular disease, physical fitness, and personal lifestyle.

Cardiorespiratory Function

Of all the components of physical fitness, none is more important than cardiorespiratory endurance, also referred to as cardiovascular endurance (Prentice, 1991). The most accurate measure of this quality is generally considered to be maximal oxygen uptake (VO2 max), which measures the amount of oxygen consumed per kilogram of body weight per minute of exercise (Johnson & Nelson, 1979). The problem with directly measuring VO2 max is the requirement of expensive laboratory equipment and the time involved in administering each test. Therefore, several tests have been

developed to accurately measure cardiorespiratory endurance in a field setting, as opposed to a laboratory. This setting is less restricting than the laboratory because procedures are less sophisticated, accommodate larger numbers of subjects, and are significantly less expensive and time-consuming (Hastad & Lacy, 1989). Astrand and Rodahl (1970) state:

> The simplest and most extensively applied way of testing the circulatory functional capacity is to determine the heart rate during or after exercise (step test, treadmill, or bicycle ergometer test). From the heart-rate response the circulatory capacity can be evaluated. (p. 350)

A practical test of cardiorespiratory function that can be used in a field setting is the step test (Johnson & Nelson, 1979; Safrit, 1990). The step test uses a submaximal, fixed workload and measures the subject's heart rate response to the exercise. Astrand and Rodahl (1970) state:

> Under normal conditions there is in any given individual a roughly linear relationship between oxygen uptake and heart rate during submaximal work. The slope of the line changes with the state of physical training or physical fitness; a fit person is able to transport the same amount of oxygen at a lower heart rate than an unfit person. This relationship in general is independent of sex and age, although females acquire higher heart rates to transport the same amount of oxygen than males. (p. 617)

Nieman (1990) writes that "submaximal exercise testing, though not as accurate, can still give a somewhat accurate picture of fitness status without the expense, risk, and hard effort" (p. 74).

The submaximal step test used in this study is presented by Golding, Myers, and Sinning (1989). They state that "it is an excellent cardiorespiratory test and can be substituted for the bicycle ergometer test when there is not enough equipment or staff" (Golding et al., 1989, p. 89).

The norms, ratings, and percentiles for the three-minute step test that are used in this study are presented in Appendix A and Appendix B.

Percent Body Fat

The structure of the human body is, to a great extent, composed of three elements--muscle, fat, and bone. A similar classification of body composition divides the human body into the amounts of fat and lean body mass. Although measurement of body weight is an important procedure in assessing body composition, a much more relevant task is establishing the percentage of body fat as compared to the percentage of lean body mass. Gettman (1988) lists nine methods in which body composition can be measured. This study used one of these methods: estimating the percentage of body fat using subcutaneous fatfold measurements.

Smith (1988) states that "overweight, or more appropriately, overfatness continues to be a common problem in the American population. Furthermore, overweight or obesity is an independent risk factor for the development of cardiovascular disease" (p. 159). Golding et al. (1989) state that "obesity is related to a higher incidence of

coronary heart disease, diabetes, cirrhosis of the liver, hernia, and intestinal obstruction and is also of considerable concern from an aesthetic standpoint" (pp. 68-69). Prentice (1991) quotes Dr. Herbert deVries as stating, "There are very few, very fat, very old people around. Your own observation--the national statistics--clearly show that long life does not mean survival of the fattest" (p. 153).

In the 1990 Heart and Stroke Facts, the American Heart Association (1989) lists obesity as one of the contributing factors in an increased risk of cardiovascular disease. The publication states:

> People who are more than 30 percent over their ideal body weight (obese) are more likely to develop heart disease and stroke even if they have no other risk factors. Obesity is unhealthy because excess weight increases the strain on the heart. It is linked with coronary heart disease mainly because it influences blood pressure and blood cholesterol, and because it can lead to diabetes. (p. 20)

Although recommended ranges of body fat are prevalent in the literature, no "ideal" percentage is suited for everyone. Variables, such as age, gender, body type, and level of fitness, play an important role in dictating an individual's percentage of body fat. Golding et al. (1989) emphasize this point by stating:

> Average relative fat values for males partly depend on age, but the new norms (YMCA, used in this study) range from 16% to 25% of the total body weight. For females, the range is 23% to 30%. Males are considered to have too much body fat if they are over 30% fat and females if over

> 35% fat. Normal fat ranges would be better at 16% to 20% for men and 19% to 23% for women. (p. 48)

McArdle, Katch and Katch (1986) define overfatness as being above 20% body fat for men and above 30% for women. Nieman (1990) outlines "optimal" percentage of body fat as 8% to 15% for men and 13% to 20% for women. He defines obese (overfat) as 25% or greater for men and 32% or greater for women.

Katch and McArdle (1983) write:

> It should be emphasized that although the average population value for percent body fat increases with age, this does not imply that men and women should be expected to get fatter as they grow older. To the contrary, the criterion for overfatness should be that established for younger men and women--above 20% for men and above 30% for women. (p. 134)

The Employee Health and Fitness Program at Southwest Texas State University (Haydon, Murray, & Edwards, 1986) detected 2 of 15 (13.3%) faculty members who were greater than 20% above ideal body weight. Two of 10 (20%) professional staff/administration members and 16 of 34 (47.1%) staff and nonprofessionals tested greater than 20% above ideal body weight.

Cooper et al. (1976) tested the percentage of body fat on nearly 3,000 men averaging 44.6 years of age. When categorized by physical fitness levels, the average percentages of body fat for the population were 29.3% for the very poor group, 26.9% for the poor group, 24.0% for the

fair group, 20.8% for the good group, and 18.2% for the excellent group.

Shephard (1988) writes that males will typically increase in body fat from 15% to 20% during their 20's, to 25% to 30% in their 40's. Eventually, when 55 to 65 years of age, "body mass begins to decline, but this decrease reflects a loss of lean tissue rather than a decrease of body fat" (p. 300). Continuing, he states that females may typically have 20% to 25% body fat during adolescence and early adult life. However, "a further build-up of adipose tissue after menopause brings many older women to a figure of 30% to 35% body fat" (p. 300).

The norms and ratings for percentages of body fat which are used in this study are presented in Appendix C and Appendix D.

Cholesterol

In his book, Cholesterol, Kritchevsky (1958) summarizes the extent and popularity of cholesterol testing by writing:

> No single facet of cholesterol has been subjected to as much study as has the blood cholesterol, for it is a clinical determination that is easy to carry out and so it has been studied in almost every disease condition of man. A large part of the literature concerns itself with some aspect of the connection between blood cholesterol levels and atherosclerosis, but studies related to other conditions are numerous. (p. 177)

In a joint statement by the American Heart Association and the National Heart, Lung, and Blood Institute, entitled

The Cholesterol Facts: A Summary of the Evidence Relating Dietary Fats, Serum Cholesterol, and Coronary Heart Disease (American Heart Association, b), the authors state:

> The evidence linking elevated serum cholesterol to coronary heart disease is overwhelming. . . . The epidemiologic evidence includes comparisons among various populations and prospective studies within populations. In both types of studies, the predictive connection between serum cholesterol levels and future occurrence of CHD is continuous and positive throughout the range of cholesterol levels typically found in the United States. (pp. 1721-1722)

The American Heart Association (1989) estimates in its 1990 Heart and Stroke Facts that 99.8 million Americans have blood cholesterol values over 200 mg/dl and about 47.2 million Americans have levels of 240 mg/dl or above. In the July 10, 1987 Morbidity and Mortality Weekly Report, the staff states, "The current nationwide prevalence estimates show that approximately 10% of persons have a serum cholesterol greater than 268 mg/dl" (p. 428). Nieman (1990) states that "the average American male and female have serum cholesterol levels of 211 and 215 mg/dl, respectively" (p. 287). Wiist (1989) quotes the National Cholesterol Education Program by stating, "The average cholesterol level is 210 mg/dl" (p. 26). In its publication, Cholesterol and Your Heart, the American Heart Association (1989) categorizes serum cholesterol measurements into three classifications. The desirable amount is less than 200 mg/dl; the borderline-high amount is 200 to 239 mg/dl; and

the high classification is an amount of 240 mg/dl and above. Caspersen and Heath (1988) state:

> Cholesterol is the predominant lipid constituent of the atherosclerotic lesion. . . . Although the range of cholesterol levels in the general population is broad and is influenced by genetic factors, the high-average level is considered of dietary origin. (pp. 112-113)

They present the following parameters in defining moderate- to high-risk cholesterol measurements. For the age group 20-29, a reading of 201-220 mg/dl is moderate risk, while greater than 220 mg/dl is considered to be high risk. For subjects age 30-39, the moderate risk is 221-240 mg/dl, and the high risk is greater than 240 mg/dl. For those individuals 40 years and older, the moderate-risk range is 240-260 mg/dl, and the high risk is considered over 260 mg/dl. In its special article, Reducing High Blood Cholesterol Levels: Recommendations from the National Cholesterol Education Program (Ernst & Cleeman, 1988), the National Heart, Lung, and Blood Institute outlines cholesterol readings of under 200 mg/dl as desirable levels, 200-239 mg/dl as borderline-high levels, and 240 mg/dl and above as high blood cholesterol levels. Smith (1988) summarizes the spectrum by stating:

> Certain populations or individuals within populations appear to be free of the atherosclerotic disease process. This freedom from atherosclerosis appears to be correlated with a total blood cholesterol level that is consistently below 150 mg/dl. As total blood cholesterol levels rise, a parallel rise in the development of atherosclerotic disease end-points occurs. For every 1% increase in the cholesterol

> level, a 2% increase occurs in the risk of heart attack. (p. 158)

Smith (1988) presents ranges on moderate- and high-risk readings that are very similar to Caspersen and Heath. However, he supplements the data with normal values for the same age groups. Normal cholesterol amounts for ages 20-29 are less than 200 mg/dl; normal cholesterol amounts for ages 30-39 are less than 220 mg/dl; and normal cholesterol amounts for ages 40 and above are less than 240 mg/dl.

Prentice (1991) recommends that:

> desirable cholesterol levels for American adults be between 180 and 200 mg/dl of blood. The risk of heart attack with cholesterol levels 250 mg/dl is twice that with 200 mg/dl, and more than four times greater at 300 mg/dl. (p. 27)

Wiist (1989) quotes the National Institutes of Health which recommend:

> Blood cholesterol levels of the entire adult population be reduced to less than 200 mg/dl and less than 180 mg/dl in those under age 30 years. . . . In the United States the blood cholesterol level of 220 mg/dl is the 50th percentile, 240 mg/dl is the 75th percentile, and 260 mg/dl the 95th percentile. (p. 24)

He continues by stating, "Some cardiovascular researchers have suggested that the ideal range is about 130 to 190 mg/dl with a mean equal to 160 mg/dl" (p. 24). Haydon et al. (1986) present data from the Employee Health and Fitness Program at Southwest Texas State University concerning actual cholesterol readings for faculty, professional staff/administration, and staff/nonprofessional

groups. Of the 15 faculty members tested, 3 (20%) had cholesterol levels greater than 240 mg/dl. Five of the 10 (50%) professional staff/administration subjects and 10 of 34 (29.4%) staff/nonprofessional members tested had cholesterol levels greater than 240 mg/dl.

Stamler, Wentworth, and Neaton (1986) write in their study, Is Relationship Between Serum Cholesterol and Risk of Premature Death From Coronary Heart Disease Continuous and Graded?:

> The 356,222 men aged 35 to 57 years, who were free of a history of hospitalization for myocardial infarction, screened by the Multiple Risk Factor Intervention Trial (MRFIT) in its recruitment effort, constitute the largest cohort with standardized serum cholesterol measurements and long-term mortality follow-up. (p. 2823)

For this population, the mean serum cholesterol for the first decile was 153.2 mg/dl, with a death rate of 3.16 per 1,000 for the six-year study. The fifth decile had a 207.5 mg/dl mean serum cholesterol and a 5.43 death rate per 1,000, while the tenth decile showed a mean serum cholesterol level of 289.5 mg/dl and a death rate of 13.05 per 1,000 subjects. They conclude:

> These data of high precision show that the relationship between serum cholesterol and CHD is not a threshold one, with increased risk confined to the two highest quintiles, but rather is a continuously graded one that powerfully affects risk for the great majority of middle-aged American men. (p. 2823)

In their cross-sectional study, entitled Physical Fitness Levels vs. Selected Coronary Risk Factors, Cooper et al. (1976) state:

> Nearly 3,000 men, averaging 44.6 years of age, were evaluated at the Cooper Clinic in Dallas, between 1971 and 1974. Eight percent of the subjects were less than 30 years of age, 30% between 30 and 39, 37% between 40 and 49, 20% between 50 and 59, and 5% above 60 years of age. 70.6% were college graduates. (p. 166)

After numerous physiological and anthropometrical tests, the subjects were categorized into the five fitness levels of very poor, poor, fair, good, and excellent. The mean cholesterol levels (mg/100 ml) were 237.1 for the very poor group, 238.5 for the poor group, 228.8 for the fair group, 222.9 for the good group, and 217.3 for the subjects considered to have an excellent level of physical fitness.

Cholesterol levels tend to increase with age. Kritchevsky (1958) writes that "the cholesterol level rises with age in both sexes, but in the sixth decade of life the male curve flattens out or drops and that for females continues to rise" (p. 179).

The ratings to be used in this study for blood cholesterol levels are presented in Appendix E.

Blood Pressure

"Elevated blood pressure levels are common in the adult American population" (Smith, 1988, p. 158). According to the American Heart Association's 1990 Heart and Stroke Facts (1989), "Hypertension or high blood pressure killed 30,900

Americans in 1987 and 60,890,000 Americans aged six and older have high blood pressure, and 46.1% don't know they have it" (p. 3).

The Special Task Force Appointed by the Steering Committee, American Heart Association (n.d.) writes in its Recommendations for Human Blood Pressure Determination by Sphygmomanometers:

> The level of arterial pressure is an important index of present cardiovascular function and risk of future cardiovascular morbidity and mortality. The lower the systolic and diastolic pressures, the better the long-term prognosis for cardiovascular health. Thus, unless the patient is in a clinical state of shock or is affected by a disease that may lower arterial pressure (e.g., blood loss, myocardial infarction), there are no adverse implications or effects of what has been commonly referred to as "low blood pressure." In contrast, the higher the systolic and diastolic pressures, the greater is the cardiovascular risk of increased morbidity and mortality. (p. 502A)

Pickering (1974) writes that "a great deal of effort has been devoted to the search for a dividing line between 'normotension' and 'hypertension.' It is evident that not all can be correct. In fact, there is no evidence for any" (p. 3).

The 1990 Heart and Stroke Facts (American Heart Association, 1989) states that a typical blood pressure reading for an adult might be 127/78 mm Hg, although readings vary, depending on age and other factors. It goes on to define hypertension, or high blood pressure, as the systolic pressure equal to or exceeding 140 mm Hg and/or a

diastolic pressure greater to or equal to 90 mm Hg for an extended period of time. Pate and Lonnett (1988) define hypertension as a resting blood pressure greater than 140/90 mm Hg. Caspersen and Heath (1988) state that "although no 'ideal' blood pressure value truly exists, evidence indicates that with each increment in both systolic and diastolic pressure, the risk for adverse cardiovascular effects increases with time" (p. 115). They continue to explain that "elevated blood pressure seldom works alone but more often in concert with other well-identified risk factors, including dietary intake, elevated lipids, obesity, smoking, diabetes mellitus, and lack of exercise" (p. 115). Golding et al. (1989) divide hypertension into four distinct categories and define normal blood pressure as being less than 150/90 mm Hg. Nieman (1990) defines normal blood pressure as less than 140/85 mm Hg. In its special communication, Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (1977) states:

> While recognizing the epidemiological data regarding increased risk from elevated systolic pressure at all ages, the committee has chosen the diastolic blood pressure as the basis for confirming high blood pressure. . . . Exceptions for consideration of evaluation and treatment might be persons younger than 35 years of age with systolic pressures higher than 150 mm Hg or those older than 60 years of age with systolic pressures higher than 180 mm Hg. (p. 257)

The committee presents an average diastolic blood pressure reading of less than 90 mm Hg as acceptable and that these individuals need only remeasure blood pressure at yearly intervals.

The Cardiovascular Care Handbook (Ford, 1986) states, "Serial blood pressure measurements on a sphygmomanometer of more than 140/90 in persons under age 50, or 150/95 in persons over age 50 confirm hypertension" (p. 143).

The Employee Health and Fitness Program at Southwest Texas State University (Haydon et al., 1986) detected 1 of 15 (6.7%) faculty members had an elevated blood pressure greater than 140/90 mm Hg. Additionally, 1 of 10 (10%) professional staff/administration members and 7 of 34 (20.6%) staff/nonprofessionals were found to have elevated blood pressures greater than 140/90 mm Hg.

Presenting the findings of 356,222 primary screenees, aged 35 to 57 years, of the Multiple Risk Factor Intervention Trial (MRFIT), Stamler et al. (1986) show that 256,190 (71.9%) had a diastolic blood pressure less than 90 mm Hg and 100,032 (28.1%) had a diastolic blood pressure greater than 90 mm Hg.

Cooper et al. (1976) performed resting systolic and diastolic blood pressure tests on nearly 3,000 men averaging 44.6 years of age. After categorizing the subjects into five levels of physical fitness, the mean resting systolic and diastolic blood pressures (mm Hg), respectively, were

132.6 and 86.6 for the very poor group, 126.5 and 83.8 for the poor group, 124.6 and 83.2 for the fair group, 122.5 and 80.9 for the good group, and 122.1 and 79.8 for the subjects considered by the authors to possess excellent physical fitness levels.

Shephard (1988) states that "the systemic blood pressure reading at rest shows a steady rise from early adulthood to the age of 65 years, with a minimal increase thereafter" (p. 303). Heath (1988) writes that "the increase in blood pressure both at rest and exercise often peaks at age 65 to 70 years, with little or no further change beyond this age level" (p. 315).

The ratings used for systolic and diastolic blood pressure readings in this study are presented in Appendix F.

Resting Heart Rate

Heart rate is often used as a fitness indicator at rest and during a standard, submaximal work task (Howley & Franks, 1986). The average resting heart rate for a sedentary individual is approximately 72 contractions per minute, while the average resting heart rate for a trained person is somewhat lower, depending on the state of training (Durstine & Pate, 1988). In well-trained subjects with a large stroke volume, rates as low as 26 beats per minute have been described (Shephard, 1988). Hoeger (1991) and Anspaugh, Hamrick, and Rosato (1991) state that the average resting heart beats between 70 and 80 beats per minute, and

rates of trained athletes are commonly near 40 beats per minute. Golding et al. (1989) write that "there is great variation in resting heart rates; normal can range anywhere from 40 to more than 90 beats per minute" (p. 34). They continue, "Resting rates do decrease with training, but this cannot be quantified relative to the amount of fitness; rather, slower heart rates may be associated with physiological abnormalities" (p. 34). Nieman (1990) writes:

> The heart rate is a variable that fluctuates widely and easily due to the same factors that influence blood pressure. . . . The resting heart rate decreases approximately one beat per minute for every one to two weeks of aerobic training for about 10 to 20 weeks. (pp. 68, 167)

Nieman (1990) also states that "resting heart rates taken prior to graded exercise testing are often elevated because of pretest apprehension" (p. 190).

Cooper et al. (1976) presented the resting heart rates (beats per minute) of nearly 3,000 men averaging 44.6 years of age. The subjects possessing a very poor level of physical fitness averaged 69.7; the poor group averaged 66.3; the fair group averaged 64.0; the good group averaged 59.5; and the subjects considered to have an excellent level of physical fitness had a mean resting heart rate of 51.6 beats per minute.

"Usually, some loss of condition occurs with aging, and the resting heart rate may thus increase by a small amount over the adult span" (Shephard, 1988, p. 297). He states:

> In many older people, this tendency is exacerbated by a decrease in stroke volume, which seems associated with coronary vascular narrowing and becomes particularly evident at higher work rates (when oxygen supply is no longer meeting cardiac demands). (p. 297)

However, Heath (1988) states that "resting heart rate shows little or no change with increasing age; however, maximal exercise heart rate shows a decline" (p. 315).

The resting heart rate ratings used in this study are presented in Appendix G and Appendix H.

Muscular Strength

A certain amount of muscular strength is needed by all individuals--regardless of age, gender, or occupation. Prentice (1991) clearly states the universal need for muscular strength by writing:

> Strength is needed in all kinds of work and physical activity. Strong muscles provide better protection of body joints, resulting in fewer sprains, strains, and muscular difficulties. Furthermore, muscle strength helps in maintaining proper posture and provides greater endurance, power, and resistance to fatigue. (p. 4)

Additionally, Corbin and Lindsey (1991) relate a person's need for a degree of strength by writing:

> Strength is needed to increase work capacity; to decrease the chance of injury; to prevent low back pain, poor posture, and other hypokinetic diseases; to improve athletic performance; and perhaps to save life or property in an emergency. Strength training increases strength of bones, tendons, and ligaments, as well as muscles. It has been found to be therapeutic for patients with chronic pain. (p. 92)

There is no single test that accurately evaluates overall body strength. Strength is specific to a muscle or muscle group. Johnson and Nelson (1979) write that strength measurement must be relative to the subject's body weight. "Since strength is a physical fitness component, it must be related to each individual and it should be measured in relation to the individual's body weight" (p. 94).

This study used the one-repetition maximum (1 RM) in the bench press exercise. Once the 1 RM (in pounds) was established, this amount was divided by the subject's weight (in pounds) to determine the muscular strength per pound of body weight. Gettman (1988) presents norms for this test that range from 1.16 to .64 for average scores for men. These scores decrease as the subject's age increases. Likewise, the average scores for women range from .71 to .41, depending on age. Nieman (1990) lists the norms for the 1 RM test and classifies the scores into the qualitative terms of excellent, good, average, fair, and poor for various values for both sexes.

Corbin and Lindsey (1991) write that "women have less muscle mass than men and typically average 60% to 85% of the 'absolute' strength of men. . . . Maximum strength is usually reached in the twenties and declines with age" (p. 96). Shephard (1988) supports the thought that the aging process has a definite effect on muscular strength by stating:

> Maximal levels of both muscle tissue quantity and strength are reached in the early twenties. A plateau of strength is maintained until about 40 to 45 years of age, thereafter followed by an accelerating loss of lean tissue and an associated decrease in strength. By the age of 65 years, most muscle groups show an 18% to 20% loss of maximal force. Again, how much of this loss is an inevitable consequence of aging and how much is a reflection of a decrease in habitual activity with advancing years is unclear. . . . The adult woman also tends to a plateau of strength between 20 and 45 years, followed by an accelerating decline of function in later life. At all ages, however, women seem somewhat more vulnerable to loss of lean tissue than are men. (p. 299)

The norms and ratings for the muscular strength test used in this study are presented in Appendix I.

Flexibility

> In the past, flexibility has been the most ignored component of health-related physical fitness. Recently, however, there has been a resurgence of interest in exercise and physical activity designed to promote and develop flexibility (Hastad & Lacy, 1989, p. 209).

"The major limitation to joint flexibility is tightness of soft tissue structures, i.e., joint capsule, muscles, tendons, and ligaments. . . . Flexibility is related to age and physical activity" (Nieman, 1990, p. 150). Golding et al. (1989) state:

> Many middle-aged people have low-back pain and disability. Often this is related to reduced flexibility of the hip and back along with reduced elasticity of the hamstrings. Most of these cases can be improved by a well-designed program of stretching exercises that increase flexibility (p. 108).

Howley and Franks (1986) write, "Maintaining a reasonable degree of flexibility is necessary for efficient body

movement; being flexible and lithe may also decrease the chances of sustaining muscle injury and/or soreness and low-back pain" (p. 105). Safrit (1990) states that "sufficient flexibility for the prevention of injury is essential, especially in the elderly population" (p. 505). There is usually a reduction of overall flexibility due to the aging process. Shephard (1988) relates this to "a progressive degeneration of collagen, the structural basis of tendons, with advancing age" (p. 300). He writes:

> The extent of the functional loss has been studied most fully for flexion of the hips and spine, as measured by the Dillion sit-and-reach test. About a 20% decrease in the range of movement on this test occurs between the ages of 25 and 65 years, with the rate of deterioration probably accelerating beyond the age of 65 years. (Shephard, 1988, p. 300)

However, he states that "if a small increase in the range of movement can be developed by an appropriate training regimen, a large gain in the quality of life may result" (Shephard, 1988, p. 300). Heath (1988) writes:

> Older adults can have significant limitations in flexibility. Changes that occur with aging have not been well-documented; however, investigators found the major cause of declining flexibility is the lack of movement with joints that are not usually used in daily activities. (pp. 316-317)

He contends that "the aging joint is generally less flexible and mobile. Connective tissue changes in muscles, ligaments, joint capsules, and tendons appear responsible for most of the loss of flexibility and mobility" (Heath, 1988, p. 317).

Corbin and Lindsey (1991) state that scores on flexibility tests may be influenced by several factors, namely, subject motivation, warm-up, muscular soreness, pain tolerance, room temperature, and the ability to relax. Additionally, they write, "Contrary to popular opinion, there is very little relationship between leg or trunk length and the scores made on flexibility tests" (p. 79).

There are several sets of norms or tables presented in the literature for the sit-and-reach test and its variations (Corbin & Lindsey, 1991; Fardy, Yanowitz, & Wilson, 1988; Kusinitz & Fine, 1991; McGlynn, 1990; Nieman, 1990; Prentice, 1991). However, these data are based on sit-and-reach tests that used different procedures, footlines, and ruler placements than were used in this study. The norms used in this study (Gettman, 1988; Golding et al., 1989) used the same methods and procedures that were used in measuring the sample population.

The norms and ratings for flexibility used in this study are presented in Appendix J and Appendix K.

TestWell

TestWell is a written, self-scoring, wellness assessment questionnaire distributed by the National Wellness Institute (1988). TestWell is founded on the six dimensions of wellness which are the emotional, physical, occupational, intellectual, spiritual, and social areas of life. The instrument surveys the 10 individual areas of

physical fitness, nutrition, self-care, drugs and driving, social choices, emotional awareness, emotional control, intellectual efforts, occupational feedback, and spiritual aspects. The test asks 10 questions in each of the 10 categories, using one to five responses. The total number of points for all 100 questions is added, and the mean for all 10 categories is the subject's score on the test. The TestWell booklet states:

> This wellness assessment was designed to provide the subject with information about wellness and to describe your current success at achieving high level well being. At the end of this assessment process, the subject should have several ideas on how to increase his or her wellness level. Use this information to increase the number of positive, responsible choices made each day. (National Wellness Institute, 1988, no page number)

The purpose of completing this written instrument was to help the subjects understand the additional and lesser known areas of health and wellness (e.g., occupation, self-care, drugs and driving) and how these aspects of their lifestyles have a great impact on their overall fitness.

The ratings for TestWell used in this study are presented in Appendix L.

CHAPTER 3

Methods and Procedures

The methods and procedures followed in this study are categorized into three areas: (1) subjects, (2) testing procedures, and (3) treatment and design.

Subjects

All full-time Lee College faculty, administrators, and professional staff members were strongly encouraged to participate as subjects in the study. Faculty considered to be full-time had a teaching load of 12 or more hours. Some full-time faculty taught less than the full load, but additional administrative or professional staff duties were used to fulfill the full-time status. The college's criterion for recognition as administration was status of administrative staff or higher. The criteria for professional staff were that the individual must be a full-time employee and his or her remuneration must be on a salary basis and not on an hourly rate.

Personal data on each subject were gathered through interviews by the researcher and by a data sheet distributed to each subject. This questionnaire surveyed any physical symptoms, injuries, surgeries, or medications which could disqualify the subject from participation in exercise testing.

The subjects were asked to read and sign an informed consent form (see Appendix M), describing the purposes, procedures, tests, dangers, and confidentiality of the study. After agreeing to participate and signing the consent form, each subject was assigned a confidential, randomly selected, four-digit number that was on all of the correspondence and forms used throughout the study. No names were used, and only the individual subject and the researcher were aware of the assigned number.

Testing Procedures

The study consisted of eight physiological tests and one written, self-scored questionnaire that examined 10 separate areas of general fitness. The eight physiological tests were: cardiorespiratory function, percent body fat, total blood cholesterol, systolic blood pressure, diastolic blood pressure, resting heart rate, muscular strength, and flexibility. The written questionnaire was TestWell, a test written and distributed by the National Wellness Institute (1988). This self-appraisal addressed the subjects' physical fitness, nutrition, self-care, drugs and driving, social choices, emotional awareness, emotional control, intellectual efforts, occupational feedback, and spiritual aspects of their lifestyles.

The tests and procedures used in this study were based on the guidelines advocated by the Y's Way to Physical

Fitness (Golding et al., 1989). Baumgartner and Jackson (1987) state:

> The YMCA has developed a health-related physical fitness program and test for adults to provide a scientifically sound plan for developing and maintaining physical fitness. The test and program was [sic] developed by leaders in the field of adult fitness, exercise physiology, and measurement. . . . The tests are used to evaluate current physical fitness, providing the basis on which physical activity is prescribed. (p. 263)

There are four reasons for using this guide. This fitness testing manual is the work of over 100 noted exercise and fitness specialists, many of whom are physicians or respected researchers, and has been revised and rewritten through the input of many individuals, committees, and programs. Secondly, the tests and procedures used are germane to researchers with modest available facilities and equipment. Thirdly, the American College of Sports Medicine (ACSM) allows the use of this test battery as part of its fitness certification. Lastly, and perhaps most importantly, the norms established in this guideline are the most extensive on the adult population in the United States and are based on results from approximately 20,000 participants divided into six age categories for each sex. The age groups of the norms range from 18 to over 65 years, which parallel ages for this study's population of college faculty, administration, and staff.

Cardiorespiratory Function

Cardiorespiratory function was measured using a submaximal, three-minute bench step test which reflected the heart rate at the end of the exercise period. This test was selected because of the large number of subjects being tested, the age range of the subjects, and the anticipated low levels of subject fitness. It required little equipment and time for each test and was a good indicator of cardiorespiratory endurance. The test required a sturdy, 12-inch bench, a metronome for dictating frequency of steps, a timing device, and forms for recording data. The metronome was set for 96 beats per minute, with each beat requiring a foot movement by the subject. Facing the bench, the subject stepped completely up on the bench with either foot at the first click of the metronome, brought the other foot on the bench at the second sound, stepped back on the floor with the lead foot at the third sound, and stepped back to the starting position at the fourth sound. This four-step process (up, up, down, down) was repeated for three minutes with each step coinciding with a beat of the metronome. Either foot was used to lead, and intermittent changing of the lead foot was permitted. Upon completion of the three minutes, the subject immediately sat down and remained still, while the researcher used manual palpation of the radial artery to measure the post-exercise heart rate. The counting started within five seconds of exercise

cessation and continued for one full minute. This one-minute heart rate, in beats per minute, was the subject's test score and was recorded on the proper form.

Percent Body Fat

The percent body fat test used Lange skinfold calipers to measure subcutaneous fatfolds at four anatomical sites. Locations measured were the abdomen (umbilicus), the ilium, the triceps, and the thigh, with the subject in the standing position and all measurements taken on the subject's right side. The abdomen site was a vertical fold approximately one inch to the right of the umbilicus; the ilium site was a diagonal fold just above the crest of the ilium; the triceps site was a vertical fold on the back of the upper arm, midway between the shoulder and elbow joints; and the thigh location was a vertical fold on the front of the thigh, midway between the groin line and the top of the patella. These exact locations were the actual places of measurement and not finger positions for pinching skinfolds. Great detail and precision were needed to assure uniformity of skinfold sites and measuring techniques. The unit of measure was millimeters (mm). The sum of the four measurements, age and sex of the subject, and Jackson and Pollock's (1978, adapted for the YMCA, cited in Golding et al., 1989) equations were used to estimate the percent body fat. To ensure more precise measurements, calculations

using the complete equations were used instead of a chart which uses a 4 mm range.

To avoid embarrassment of female subjects, a qualified female researcher performed all skinfold tests on the female subjects. The investigator assured the use of identical testing procedures by discussing and demonstrating proper techniques with the female researcher prior to the start of testing. In addition, the investigator coordinated all test administrations and was near the test site if questions arose during the skinfold testing of female subjects.

Cholesterol

The blood cholesterol testing involved drawing a sample of blood from the subject's arm and having that sample analyzed at a local hospital laboratory. All first attempts for the blood sample were made using the subject's right arm. However, in some instances, vascular problems dictated the use of the subject's left arm. All blood work was done by certified professionals.

The lab results forwarded to the subject included total cholesterol level (TC), high-density lipoprotein level (HDL), low-density lipoprotein level (LDL), triglycerides level, and glucose level. This data allowed the ratio of TC/HDL to be established for each participant. However, only the total cholesterol level (TC) was used in the study.

Resting Blood Pressure

Resting blood pressure was measured by a registered nurse using an aneroid sphygmomanometer, various sizes of pressure cuffs, and a stethoscope. The subject was sitting in an upright position and remained quiet for the test. The antecubital space and brachial artery of the subject's right arm were used. Both the systolic (first phase) and diastolic (fifth phase) were measured in millimeters of mercury (mm Hg) and recorded on the proper form.

Resting Heart Rate

Resting heart rate was measured by a registered nurse using chest auscultation of the apical area of the subject's heart while the participant was at rest in a sitting position. The rate was taken for one full minute after the subject had adequate rest. This amount of rest was of sufficient duration to allow the heart rate to stabilize at its lowest rate. The one-minute resting heart rate was measured in beats per minute and was recorded on the proper form.

Muscular Strength

Muscular strength was measured by an isotonic, maximum bench press exercise, using free weights and a bench designed specifically for this bench press exercise. The participant was allowed to warm up by stretching, and the resistance of the first trial was knowingly lower than the expected one-repetition maximum (1 RM) bench press. The

1 RM is the maximum amount of resistance that can be successfully lifted only one time. The resistance was gradually increased until the 1 RM was established. The 1 RM (in pounds) was recorded, then divided by the participant's body weight (in pounds), and recorded on the proper form.

Flexibility

No single test accurately measures overall or general flexibility. Gettman (1988) states that "no general test is available that provides representative values of total body flexibility; tests are specific to each joint and muscle group and connective tissue area" (p. 164). However, the measurement of trunk flexion using the modified sit-and-reach test is used as an indicator of the subject's flexibility (Johnson & Nelson, 1979).

The sit-and-reach test was chosen for this study because it involves more than just the back muscles. Gettman (1988) writes that "the sit-and-reach test also involves the extensibility (or tightness) of the hamstring musculature, buttocks, lower back, upper back, and shoulders" (p. 165).

After having sufficient time to perform warm-up and stretching exercises, the subject sat, with both legs extended in front, on a four-foot by two-foot plywood board constructed for this test. Attached blocks of wood were used to secure the subject's feet in the proper position and

to prevent the feet from moving. A 30-inch ruler, extending perpendicular from the mid-section of the subject, was attached to the board and centered between the subject's legs. The 15-inch point of the ruler was even with the bottom of the feet and the zero point closest to the subject. The participant lowered his or her head and slowly reached with the hands as far forward on the ruler as was possible without bending (flexing) at the knees or moving the legs (external rotation of the femur). The hands remained together with the fingertips parallel to the floor. The flexed position was held long enough for the researcher to read the point on the ruler, but did not cause undue strain on the subject. Three trials were performed, and each distance (to the nearest quarter of an inch) was recorded. The greatest of the three measurements was used as the score for the test.

TestWell

One copy of the test, a letter of explanation, and specific directions were mailed to each subject. The phone number and address of the researcher were listed for a subject who had difficulties completing the questionnaire. After two weeks, a reminder letter was sent to those subjects not returning the test. All calculations were verified by the researcher prior to the final recording of scores on the proper form.

Testing Information

Specific instructions for the tests were given to the participants at least 48 hours before testing began. These included the rest, fasting, and vigorous exercise that were expected or allowed prior to the tests and the type of attire to be worn to the test sight. The subjects were instructed to wear clothing and shoes that were suitable for jogging or similar exercise, to have at least eight hours of rest the night before testing, to consume no food or beverage for three hours before the fitness testing, and to refrain from exercise the day of the tests. The subjects were asked to abstain from food and exercise for 12-14 hours prior to the drawing of blood for the cholesterol test.

The order of testing was very important. On the subject's first day of testing, the resting heart rate, resting blood pressure, height, and weight were measured after a 5- to 10-minute rest period. Drawing the blood sample for the cholesterol test was the last procedure done on the first day. If this order was changed and the blood sample was taken before the other tests, subject anxiety and anticipation concerning the drawing of blood would falsely elevate the resting heart rate and the resting blood pressure.

The second day of testing included, in this sequence, tests for cardiorespiratory function, muscular strength, flexibility, and percent body fat. As in the first battery

of tests, the order of test administration was critically important. Tests that would elevate the subject's heart rate were not performed before the cardiorespiratory endurance test, which used the heart's response to a given workload of exercise as the main criterion.

Treatment and Design

The treatment of the data is descriptive in nature. In their book, Research Methods in Physical Activity, Thomas and Nelson (1990) state that:

> descriptive research is a study of status that is widely used in education and the behavioral sciences. Its value is based on the premise that problems can be solved and practices improved through objective and thorough observation, analysis, and description. (p. 263)

The means and standard deviations for each of the variables are presented for the entire sample population, the faculty, the administration and staff, both sexes, and the seven sex-age groups. In addition, ratings presented by authoritative sources, such as the American Heart Association and the National Heart, Lung, and Blood Institute, are used to describe the quality of the subject scores.

CHAPTER 4

Analysis of the Data

In September 1991, the researcher distributed cover letters and informed consent sheets to all faculty, administrators, administrative staff, and professional staff members eligible for participation in the study. The cover letter explained the study and the purposes, while the informed consent described each test and testing procedure and the possible risks involved in fitness testing and asked for the participant's signature upon agreeing to participate.

Of the 115 persons eligible for the study, 75 agreed to be tested and signed the informed consent sheet, constituting a 65.2% participation rate. Of these 75 subjects, 48 (64%) were males, and 27 (36%) were females. Staff made up 9.4% (N = 7) of the sample population; administration constituted 25.3% (N = 19) of the sample population; while faculty subjects were 65.3% (N = 49) of the sample population. The descriptive statistics for all population groups by physiological variables are presented in Appendix O.

Age

Of the 75 subjects tested, the mean age was 42.16 years, while the standard deviation was 10.7. The ages ranged from 22 to 68 years.

When divided into age categories, 2 subjects (2.67%) were in the 18-25 age group; 20 subjects (26.67%) were in the 26-35 age group; 26 subjects (34.67%) were in the 36-45 age group; 18 subjects (24.0%) were in the 46-55 age group; 8 subjects (10.67%) were in the 56-65 age group; and 1 subject (1.33%) was over age 65. For the purpose of the subject confidentiality, the two subjects in the 18-25 age group, the single female subject in the 56-65 age group, and the one subject over age 65 are deleted from study findings. Additionally, because of the low number of subjects in the staff category (N = 7), the administration and staff data are reported as one group.

Cardiorespiratory Function

Cardiorespiratory function was measured using a submaximal bench step test. The score for this test is the subject's heart rate immediately after the three-minute exercise. As shown in Table 1, the mean score for the sample population was 116.43 bpm with a standard deviation of 17.18. Using the norms and ratings from the YMCA (Golding et al., 1989), 1.3% (N = 1) were in the excellent range; 14.9% (N = 11) were in the good range; 16.2% (N = 12) were in the above-average range; 12.1% (N = 9) were in the average range; 14.9% (N = 11) were in the below-average range; 25.7% (N = 19) were in the poor range; and 14.9% (N = 11) were in the very poor range for the cardiovascular function test. The average score for the faculty was 119.63

Table 1

Descriptive Statistics for Cardiorespiratory Function by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	116.43	17.18
Faculty	49	119.63	17.51
Administration and staff	26	110.54	15.17
Males	48	113.70	17.17
Females	27	121.19	16.46
Males (ages 26-35)	8	107.75	11.26
Males (ages 36-45)	19	113.39	17.31
Males (ages 46-55)	13	122.15	20.52
Males (ages 56-65)	7	106.71	12.27
Females (ages 26-35)	12	119.00	18.95
Females (ages 36-45)	7	126.00	11.68
Females (ages 46-55)	5	132.60	1.34

with a standard deviation of 17.51. For the faculty, 2.1% (N = 1) were in the excellent range; 10.4% (N = 5) were in the good range; 12.5% (N = 6) were in the above-average, average, and below-average ranges; 29.2% (N = 14) were in the poor range; and 20.8% (N = 10) were in the very poor range. The administration and staff averaged 110.54 with a standard deviation of 15.17, with 23.1% (N = 6) in the good and above-average ranges, 11.5% (N = 3) in the average range, 19.2% (N = 5) in the below-average and fair ranges, and 3.9% (N = 1) in the very poor range. Males averaged 113.70 with a standard deviation of 17.17. For this group, 2.1% (N = 1) were in the excellent range; 10.6% (N = 5) were in the good range; 21.3% (N = 10) were in the above-average range; 17.0% (N = 8) were in the average range; 10.6% (N = 5) were in the below-average range; and 19.2% (N = 9) were in the poor and very poor ranges for the cardiovascular function test. Females averaged 121.19 with a standard deviation of 16.46, with 22.2% (N = 6) in the good range, 7.4% (N = 2) in the above-average range, 3.7% (N = 1) in the average range, 22.2% (N = 6) in the below-average range, 37.1% (N = 10) in the poor range, and 7.4% (N = 2) in the very poor range (see Table 1).

Percent Body Fat

The mean percentage of body fat for the entire sample population was 24.67 with a standard deviation of 6.17 (see Table 2). Using the norms and ratings from the YMCA

Table 2

Descriptive Statistics for Percent Body Fat by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	24.67	6.17
Faculty	49	25.54	6.73
Administration and staff	26	23.03	4.63
Males	48	22.79	5.16
Females	27	28.02	6.49
Males (ages 26-35)	8	19.25	5.17
Males (ages 36-45)	19	21.70	4.69
Males (ages 46-55)	13	26.55	3.93
Males (ages 56-65)	7	23.93	4.17
Females (ages 26-35)	12	25.78	5.39
Females (ages 36-45)	7	28.51	6.63
Females (ages 46-55)	5	33.49	5.75

(Golding et al., 1989), 6.7% (N = 5) of the sample population were in the excellent range; 14.7% (N = 11) were in the good range; 16.0% (N = 12) were in the above-average range; 21.3% (N = 16) were in the average range; 22.7% (N = 17) were in the below-average range; 13.3% (N = 10) were in the poor range; and 5.3% (N = 4) were in the very poor range of percent body fat. The mean for the faculty was 25.54 with a standard deviation of 6.73, with 8.2% (N = 4) in the excellent range, 14.3% (N = 7) in the good range, 10.2% (N = 5) in the above-average range, 20.4% (N = 10) in the average and below-average ranges, 18.3% (N = 9) in the poor range, and 8.2% (N = 4) in the very poor range. The mean for the administration and staff was 23.03 with a standard deviation of 4.63. For this subject group, 3.8% (N = 1) were in the excellent range; 15.3% (N = 4) were in the good range; 27.0% (N = 7) were in the above-average range; 23.1% (N = 6) were in the average range; 27.0% (N = 7) were in the below-average range; and 3.8% (N = 1) were in the poor range. The males of the population averaged 22.79% with a standard deviation of 5.16, with 8.3% (N = 4) in the excellent range, 10.4% (N = 5) in the good range, 20.8% (N = 10) in the above-average range, 25.0% (N = 12) in the average range, 22.4% (N = 11) in the below-average range, and 6.3% (N = 3) in the poor and very poor ranges of percent body fat. The females of the population averaged 28.02% body fat with a standard deviation of 6.49. For the female subjects, 3.7%

(N = 1) were in the excellent range; 22.2% (N = 6) were in the good range; 7.4% (N = 2) were in the above-average range; 14.8% (N = 4) were in the average range; 22.2% (N = 6) were in the below-average range; 26.0% (N = 7) were in the poor range; and 3.7% (N = 1) were in the very poor range of percent body fat.

McArdle et al. (1986) define overfatness as being above 20% body fat for men and above 30% for women. Using these percentages for comparison, 79.17% (N = 38) of the male subjects and 40.74% (N = 11) of the female subjects were overfat. Nieman (1990) defines obese (overfat) as 25% or greater for men and 32% or greater for women. Applying these criteria to the sample population shows 33.33% (N = 16) of the males and 29.63% (N = 8) of the females as being overfat. Nieman (1990) outlines "optimal" percentage of body fat as 8% to 15% for men and 13% to 20% for women. Using these ranges, 6.25% (N = 3) of the male subjects and 11.11% (N = 3) of the female subjects had "optimal" percentages of body fat.

The Employee Health and Fitness Program at Southwest Texas State University (Haydon et al., 1986) detected 13.3% (N = 2) of the faculty members and 20% (N = 2) of the professional staff/administration members who had percentages of body fat greater than 20%. Comparing the sample population, 83.67% (N = 41) of the faculty and 84.62% (N = 22) of the administration and staff were above the 20%

body fat standard. This difference can be partially explained by the larger percent of female subjects in the Lee College study.

Cholesterol

The total cholesterol mean for the entire sample was 201.60 mg/dl with a standard deviation of 36.57 (see Table 3). The cholesterol guidelines from Cholesterol and Your Heart (American Heart Association, 1989) and the National Heart, Lung, and Blood Institute (Ernst & Cleeman, 1988) classify readings of less than 200 mg/dl as desirable cholesterol levels, 200 to 239 mg/dl as borderline-high cholesterol levels, and 240 mg/dl and above as high cholesterol levels. Using these classifications, 49.3% (N = 37) of the entire sample had desirable levels; 32.0% (N = 24) had borderline-high levels; and 18.7% (N = 14) had high levels. The faculty averaged 201.94 mg/dl with a standard deviation of 37.85, with 49.0% (N = 24) having desirable cholesterol levels, 32.6% (N = 16) having borderline-high cholesterol levels, and 18.4% (N = 9) having high cholesterol levels. The administration and staff averaged 200.96 mg/dl with a standard deviation of 34.73. Of this group, 50.0% (N = 13) had desirable levels; 30.8% (N = 8) had borderline-high levels; and 19.2% (N = 5) had high levels. The mean for the males was 205.02 mg/dl with a standard deviation of 34.56, with 37.5% (N = 18) having desirable cholesterol levels, 43.7% (N = 21) having

Table 3

Descriptive Statistics for Cholesterol
by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	201.60	36.57
Faculty	49	201.94	37.85
Administration and staff	26	200.96	34.73
Males	48	205.02	34.56
Females	27	195.52	39.83
Males (ages 26-35)	8	174.25	14.61
Males (ages 36-45)	19	206.05	31.35
Males (ages 46-55)	13	215.62	36.48
Males (ages 56-65)	7	224.29	34.71
Females (ages 26-35)	12	187.83	38.18
Females (ages 36-45)	7	180.00	29.33
Females (ages 46-55)	5	233.60	39.51

borderline-high cholesterol levels, and 18.8% (N = 9) having high cholesterol levels. The females averaged 195.52 mg/dl with a standard deviation of 39.83, with 70.4% (N = 19) having desirable cholesterol levels, 11.1% (N = 3) having borderline-high cholesterol levels, and 18.5% (N = 5) having high cholesterol levels.

The July 10, 1987 Morbidity and Mortality Weekly Report states, "The current nationwide prevalence estimates show that approximately 10% of persons have a serum cholesterol greater than 268 mg/dl" (Staff, 1987, p. 428). The sample population had 4.00% (N = 3) subjects with cholesterol levels over 268 mg/dl. Nieman (1990) states that "the average American male and female have serum cholesterol levels of 211 and 215 mg/dl respectively" (p. 287), and Wiist (1989) states that "the average cholesterol level is 210 mg/dl" (p. 26). In this study, the males averaged 205.02, and the females averaged 195.52.

Wiist (1989) states, "Some cardiovascular researchers have suggested that the ideal range is about 130 to 190 mg/dl . . ." (p. 24). This study had 44.00% (N = 33) of the subjects in this ideal range. Haydon et al. (1986) present data from the Employee Health and Fitness Program at Southwest Texas State University which describe 20% (N = 3) of the faculty members and 50% (N = 5) of the professional staff/administration subjects having cholesterol levels greater than 240 mg/dl. The Lee College sample population

had 18.37% (N = 9) faculty members and 19.23% (N = 5) administration and staff members with cholesterol levels greater than 240 mg/dl (see Table 3).

Systolic Blood Pressure

As shown in Table 4, the mean systolic blood pressure for the entire sample was 124.67 with a standard deviation of 14.97. According to the 1988 Report of the Joint National Committee on the Detection, Evaluation, and Treatment of High Blood Pressure (cited in Nieman, 1990), 84.0% (N = 63) of the entire population were in the normal systolic range; 13.3% (N = 10) were in the borderline hypertensive range; and 2.7% (N = 2) were in the isolated hypertensive range. The mean for the faculty was 125.78 with a standard deviation of 15.78, with 81.6% (N = 40) faculty members in the normal range, 14.3% (N = 7) in the borderline hypertensive range, and 4.1% (N = 2) in the isolated hypertensive range. The administration and staff averaged 122.58 with a standard deviation of 13.36, with 88.5% (N = 23) within the normal limits and the remaining 11.5% (N = 3) measuring borderline hypertensive systolic pressures. The males of the population averaged 129.73 with a standard deviation of 14.65. Of this gender, 77.0% (N = 37) had normal systolic pressures; 18.8% (N = 9) had borderline hypertensive pressures; and 4.2% (N = 2) had isolated hypertensive pressures. The females of the population averaged 115.67 with a standard deviation of

Table 4

Descriptive Statistics for Systolic Blood Pressure by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	124.67	14.97
Faculty	49	125.78	15.78
Administration and staff	26	122.58	13.36
Males	48	129.73	14.65
Females	27	115.67	10.90
Males (ages 26-35)	8	122.75	10.20
Males (ages 36-45)	19	125.00	11.39
Males (ages 46-55)	13	130.15	11.53
Males (ages 56-65)	7	145.43	18.10
Females (ages 26-35)	12	108.92	7.76
Females (ages 36-45)	7	116.86	7.38
Females (ages 46-55)	5	126.00	12.41

10.90, with 96.3% (N = 26) having normal systolic pressures and 3.7% (N = 1) having borderline hypertensive pressures.

Smith (1988) states, "Elevated blood pressure levels are common in the adult American population" (p. 158). However, 84.00% of the subjects in this study were within the normal limit (less than 140 mm Hg) for systolic blood pressure. The 1990 Heart and Stroke Facts (American Heart Association, 1989) suggests that a typical systolic pressure reading for an adult might be 127 mm Hg. The subjects in this study had an average systolic pressure of 124.67 mm Hg.

Diastolic Blood Pressure

The mean diastolic blood pressure for the entire population was 75.87 with a standard deviation of 9.03 (see Table 5). Using the 1988 Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (cited in Nieman, 1990), 85.3% (N = 64) of the sample population tested within the normal diastolic range, 9.3% (N = 7) within the high-normal pressure range, and 5.4% (N = 4) within the mild hypertensive pressure range. The mean for the faculty was 76.90 with a standard deviation of 8.95, with 81.6% (N = 40) recording normal pressures, 12.3% (N = 6) recording high-normal pressures, and 6.1% (N = 3) recording mild hypertensive pressures. The administration and staff averaged 73.92 with a standard deviation of 9.04. In this subject group, 92.4% (N = 24) recorded normal pressures; 3.8% (N = 1) recorded high-normal

Table 5

Descriptive Statistics for Diastolic Blood Pressure by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	75.87	9.03
Faculty	49	76.90	8.95
Administration and staff	26	73.92	9.04
Males	48	79.79	7.71
Females	27	68.89	6.76
Males (ages 26-35)	8	73.75	3.62
Males (ages 36-45)	19	78.95	5.67
Males (ages 46-55)	13	80.62	9.00
Males (ages 56-65)	7	84.86	7.38
Females (ages 26-35)	12	65.50	5.05
Females (ages 36-45)	7	70.86	6.31
Females (ages 46-55)	5	74.40	8.30

pressures; and 3.8% (N = 1) recorded mild hypertensive pressures. The males averaged 79.79 with a standard deviation of 7.71, with 79.2% (N = 38) recording normal pressures, 12.5% (N = 6) recording high-normal pressures, and 8.3% (N = 4) recording mild hypertensive pressures. The female mean diastolic pressure was 68.89 with a standard deviation of 6.76, with 96.3% (N = 26) within normal limits and 3.7% (N = 1) having a high-normal reading.

Smith (1988) states, "Elevated blood pressure levels are common in the American adult population" (p. 158). To the contrary, in this study 85.30% (N = 64) recorded diastolic pressures within the normal limit (less than 85 mm Hg). The 1990 Heart and Stroke Facts (American Heart Association, 1989) states that a typical diastolic pressure reading for an adult might be 78 mm Hg. The subjects in this study averaged 75.87 mm Hg for the diastolic pressure readings. Stamler et al. (1986) present the diastolic pressure data from 356,222 primary screenees aged 35 to 57 years. Of this large sample, 71.9% (N = 256,190) had diastolic pressures less than 90 mm Hg, and 28.1% (N = 100,032) had diastolic pressures greater than 90 mm Hg. For the Lee College sample, 94.6% (N = 71) had diastolic pressures less than 90 mm Hg, and 5.4% (N = 4) had diastolic pressures equal to or greater than 90 mm Hg (see Table 5).

Resting Heart Rate

As shown in Table 6, the mean resting heart rate for the entire sample was 72.01 bpm with a standard deviation of 9.80. Using the YMCA norms and ratings (Golding et al., 1989), 4.0% (N = 3) of the sample population had resting heart rates in the excellent range, 14.7% (N = 11) in the good range, 18.7% (N = 14) in the above-average range, 13.3% (N = 10) in the average range, 20.0% (N = 15) in the below-average and poor ranges, and 9.3% (N = 7) in the very poor range. The faculty mean was 73.41 with a standard deviation of 9.51, with 2.0% (N = 1) having excellent resting heart rates, 10.2% (N = 5) having good resting heart rates, 22.5% (N = 11) having above-average resting heart rates, 14.3% (N = 7) having average resting heart rates, 16.3% (N = 8) having below-average resting heart rates, 24.5% (N = 12) having poor resting heart rates, and 10.2% (N = 5) having very poor resting heart rates. The administration and staff averaged 69.39 with a standard deviation of 9.97. Of this group, 7.7% (N = 2) had excellent resting heart rates; 23.1% (N = 6) had good resting heart rates; 11.5% (N = 3) had above-average and average resting heart rates; 27.0% (N = 7) had below-average resting heart rates; 11.5% (N = 3) had poor resting heart rates; and 7.7% (N = 2) had very poor resting heart rates. The males averaged 71.40 with a standard deviation of 10.38, with 6.3% (N = 3) having excellent resting heart rates, 12.5% (N = 6) having good

Table 6

Descriptive Statistics for Resting Heart Rate by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	72.01	9.80
Faculty	49	73.41	9.51
Administration and staff	26	69.39	9.97
Males	48	71.40	10.38
Females	27	73.11	8.74
Males (ages 26-35)	8	65.63	10.11
Males (ages 36-45)	19	72.95	9.00
Males (ages 46-55)	13	73.39	8.38
Males (ages 56-65)	7	66.00	10.52
Females (ages 26-35)	12	74.17	10.78
Females (ages 36-45)	7	72.86	5.73
Females (ages 46-55)	5	74.80	9.34

resting heart rates, 14.5% (N = 7) having above-average resting heart rates, 18.8% (N = 9) having average and below-average resting heart rates, 20.8% (N = 10) having poor resting heart rates, and 8.3% (N = 4) having very poor resting heart rates. The female mean was 73.11 with a standard deviation of 8.74, with 18.5% (N = 5) having good resting heart rates, 26.0% (N = 7) having above-average resting heart rates, 3.7% (N = 1) having average resting heart rates, 22.2% (N = 6) having below-average resting heart rates, 18.5% (N = 5) having poor resting heart rates, and 11.1% (N = 3) having very poor resting heart rates.

Durstine and Pate (1988) state that the resting heart rate for a sedentary individual is approximately 72 contractions per minute. Hoeger (1991) and Anspaugh et al. (1991) write that the average resting heart beats between 70 and 80 beats per minute. The average resting heart rate for the sample population in this study was 72.01 beats per minute.

Muscular Strength

The mean 1 RM/weight for the entire population was .58 with a standard deviation of .22 (see Table 7). Using the 1985 Physical Fitness Norms from the Institute for Aerobics Research (Gettman, 1988), 4.1% (N = 3) scored in the excellent range; 1.4% (N = 1) scored in the good range; 16.4% (N = 12) scored in the average range; 8.2% (N = 6) scored in the fair range; and 69.9% (N = 51) scored in the

Table 7

Descriptive Statistics for Muscular Strength by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	.58	.22
Faculty	49	.55	.23
Administration and staff	26	.62	.21
Males	48	.68	.20
Females	27	.39	.12
Males (ages 26-35)	8	.80	.17
Males (ages 36-45)	19	.75	.21
Males (ages 46-55)	13	.59	.17
Males (ages 56-65)	7	.52	.10
Females (ages 26-35)	12	.43	.13
Females (ages 36-45)	7	.36	.10
Females (ages 46-55)	5	.30	.08

poor range for the strength test. The faculty averaged .55 with a standard deviation of .23, with 2.1% (N = 1) in both the excellent and good strength ranges, 14.9% (N = 7) in the average strength range, 10.7% (N = 5) in the fair strength range, and 70.2% (N = 33) in the poor strength range. The administration and staff mean was .62 with a standard deviation of .21. This group had 7.7% (N = 2) in the excellent strength range, 19.2% (N = 5) in the average strength range, 3.8% (N = 1) in the fair strength range, and 69.3% (N = 18) in the poor strength range. The mean for the males of the population was .68 with a standard deviation of .20, with 6.3% (N = 3) in the excellent strength range, 20.8% (N = 10) in the average strength range, 10.4% (N = 5) in the fair strength range, and 62.5% (N = 30) in the poor strength range. The females of the population averaged .39 with a standard deviation of .12, with 4.0% (N = 1) scoring in the good strength range, 8.0% (N = 2) scoring in the average strength range, 4.0% (N = 1) scoring in the fair strength range, and 84.0% (N = 21) scoring in the poor strength range.

Flexibility

The mean flexibility score for the entire population was 14.53 with a standard deviation of 3.55 (see Table 8). Using the YMCA norms and ratings (Golding et al., 1989), 2.7% (N = 2) of the entire sample were in the excellent range; 18.7% (N = 14) were in the good range; 20.0% (N = 15)

Table 8

Descriptive Statistics for Flexibility
by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	14.53	3.55
Faculty	49	14.04	3.58
Administration and staff	26	15.46	3.35
Males	48	14.00	3.42
Females	27	15.48	3.64
Males (ages 26-35)	8	16.13	2.10
Males (ages 36-45)	19	14.32	3.22
Males (ages 46-55)	13	13.08	3.57
Males (ages 56-65)	7	12.71	4.35
Females (ages 26-35)	12	15.83	3.71
Females (ages 36-45)	7	16.43	1.90
Females (ages 46-55)	5	12.80	1.48

were in the above-average range; 13.3% (N = 10) were in the average range; 16.0% (N = 12) were in the below-average range; 20.0% (N = 15) were in the poor range; and 9.3% (N = 7) were in the very poor range on the flexibility test. The faculty mean was 14.04 with a standard deviation of 3.58, with 4.1% (N = 2) in the excellent range, 18.4% (N = 9) in the good range, 16.3% (N = 8) in the above-average range, 18.4% (N = 9) in the average range, 20.4% (N = 10) in the below-average range, 16.3% (N = 8) in the poor range, and 6.1% (N = 3) in the very poor range. The administration and staff averaged 15.46 with a standard deviation of 3.35. Of this group, 19.2% (N = 5) had excellent flexibility; 23.1% (N = 6) had good flexibility; 34.7% (N = 9) had above-average flexibility; 11.5% (N = 3) had below-average flexibility; 7.7% (N = 2) had poor flexibility; and 3.8% (N = 1) had very poor flexibility. The mean for the males of the population was 14.00 with a standard deviation of 3.42, with 4.2% (N = 2) having excellent flexibility, 25.0% (N = 12) having good flexibility, 18.8% (N = 9) having above-average flexibility, 25.0% (N = 12) having average flexibility, 16.7% (N = 8) having below-average flexibility, 8.3% (N = 4) having poor flexibility, and 2.0% (N = 1) having very poor flexibility. The females of the population averaged 15.48 with a standard deviation of 3.64, with 7.5% (N = 2) having good flexibility, 18.5% (N = 5) having above-average flexibility, 22.2% (N = 6) having average

flexibility, 18.5% (N = 5) having below-average flexibility, 22.2% (N = 6) having poor flexibility, and 11.1% (N = 3) having very poor flexibility.

TestWell

The mean for the entire population was 80.92 with a standard deviation of 6.51 (see Table 9). Using the score interpretations given by the National Wellness Institute (1988) for TestWell, 8.0% (N = 6) of the entire population scored in the excellent range; 48.0% (N = 36) scored in the good range; 38.7% (N = 29) scored in the average range; and 5.3% (N = 4) scored in the fair range for this written test. The faculty averaged 81.50 with a standard deviation of 5.86, with 6.1% (N = 3) in the excellent range, 55.1% (N = 27) in the good range, 36.7% (N = 18) in the average range, and 2.1% (N = 1) in the fair range. The administration and staff mean was 79.83 with a standard deviation of 7.58. Of this group, 11.5% (N = 3) were in the excellent range; 34.7% (N = 9) were in the good range; 42.3% (N = 11) were in the average range; and 11.5% (N = 3) were in the fair range of scores. The males averaged 82.03 with a standard deviation of 5.78, with 8.3% (N = 4) in the excellent range, 52.1% (N = 25) in the good range, 37.5% (N = 18) in the average range, and 2.1% (N = 1) in the fair range of scores. The female mean was 78.95 with a standard deviation of 7.34. The percentages for the female subjects were: 7.5% (N = 2) in the excellent range; 40.7% (N = 11) in the good and

Table 9

Descriptive Statistics for TestWell
by Subject Groups

Group	N	Mean	Standard deviation
Total sample	75	80.92	6.51
Faculty	49	81.50	5.86
Administration and staff	26	79.83	7.58
Males	48	82.03	5.78
Females	27	78.95	7.34
Males (ages 26-35)	8	80.65	6.67
Males (ages 36-45)	19	81.32	4.98
Males (ages 46-55)	13	82.08	4.34
Males (ages 56-65)	7	83.33	7.42
Females (ages 26-35)	12	76.71	8.06
Females (ages 36-45)	7	81.20	4.51
Females (ages 46-55)	5	80.84	5.29

average ranges; and 11.1% (N = 3) in the fair range of scores (see Table 9).

CHAPTER 5

Summary

This study was undertaken to determine and appraise the overall physical fitness level of Lee College faculty, administration, and staff. The subjects were selected on a volunteer basis and were tested using the following physiological variables: cardiorespiratory function, percent body fat, total cholesterol level, resting blood pressure, resting heart rate, muscular strength, and flexibility. In addition, TestWell, a written self-appraisal was completed by each subject. All data were reported as means, standard deviations, and percentages on a descriptive basis using selected norms and ratings from authoritative and respected sources, such as the American Heart Association; the National Heart, Lung, and Blood Institute; and the Y's Way to Physical Fitness (Golding et al., 1989).

Conclusions

1. The sample population was better than below-average, based on YMCA norms and ratings for the cardiorespiratory function test.

2. The sample population was average, based on the YMCA norms and ratings for percent of body fat.

3. The sample population was in the borderline-high category of total cholesterol, according to the American Heart Association ratings.

4. The sample population was within the normal limit of systolic blood pressure when compared to the 1988 Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (cited in Nieman, 1990).

5. The sample population was within the normal limit of diastolic blood pressure when compared to the 1988 Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (cited in Nieman, 1990).

6. The resting heart rate for the sample population was average, based on the YMCA norms and ratings.

7. The muscular strength for the sample population was fair when compared to the 1985 Physical Fitness Ratings adapted from The Institute for Aerobics Research (Gettman, 1988).

8. The flexibility for the sample population was average when compared to the YMCA norms and ratings.

9. The TestWell scores for the sample population were in the good range, based on ratings presented by the National Wellness Institute, Inc. (1988).

Recommendations

The primary concern of this study was to determine and appraise the physical fitness levels of persons working in an occupation usually considered to be sedentary. Based on personal interviews, fitness testing, written test scores, and conclusions, the following recommendations are made:

1. More faculty, administration, and staff members at Lee College need to have their fitness levels measured. Of the 115 persons eligible for this study, 65.2% (N = 75) participated in the testing. The remaining employees need to be tested using the same variables.

2. More faculty, administration, and staff members at Lee College need to have their cholesterol levels analyzed more frequently. Several of the subjects stated this was the first time to have their cholesterol level checked.

3. The faculty, administration, and staff members who had poor scores on the muscular strength test (69.9%, N = 51) should be made aware of the problems associated with poor muscular strength and advised of proper methods and exercises to improve their level of muscular strength.

4. Faculty, administration, and staff members who had low scores on the written questionnaire should be made aware of the many areas of their lifestyles which make up their overall health and well-being and why improvement in their poor areas would benefit them.

5. Faculty, administration, and staff members at Lee College who performed poorly on these fitness tests should be encouraged to either develop or improve their overall fitness. The college should take a more active role in the health, wellness, and exercise programs of these employees. This action could have direct benefits to the individual and to the college.

> We are all in a dynamic process of moving toward or away from behavior that is either destructive or beneficial to our health. It is therefore important for each individual to take responsibility for the direction in which they [sic] choose to move. (McGlynn, 1990, p. 2)

It was the intention of this study to help Lee College faculty, administration, and staff members move toward the attitudes and behaviors that will benefit their present and future physical fitness, health, and lifestyles.

APPENDICES

APPENDIX A

NORMS, RATINGS, AND PERCENTILES FOR CARDIORESPIRATORY FUNCTION FOR MALES

APPENDIX A

NORMS, RATINGS, AND PERCENTILES FOR CARDIORESPIRATORY FUNCTION FOR MALES

		Ages (in years)			
Rating	Percentile	26-35	36-45	46-55	56-65
Excellent	100	73	72	78	72
	95	76	74	81	74
	90	79	81	84	82
Good	85	83	86	89	89
	80	85	90	93	93
	75	88	94	96	97
Above-average	70	91	98	99	98
	65	94	100	101	100
	60	97	102	103	101
Average	55	101	105	109	105
	50	103	108	113	109
	45	106	111	115	111
Below-average	40	109	113	118	113
	35	113	116	120	116
	30	116	118	121	118
Poor	25	119	120	124	122
	20	122	124	126	125
	15	126	128	130	128
Very poor	10	130	132	135	131
	5	140	142	145	136
	0	164	168	158	150

Source: Golding, Myers, and Sinning (1989, pp. 114-117).

APPENDIX B

NORMS, RATINGS, AND PERCENTILES FOR CARDIORESPIRATORY FUNCTION FOR FEMALES

APPENDIX B

NORMS, RATINGS, AND PERCENTILES FOR CARDIORESPIRATORY FUNCTION FOR FEMALES

		Ages (in years)			
Rating	Percentile	26-35	36-45	46-55	56-65
Excellent	100	72	74	76	74
	95	80	80	88	83
	90	86	87	93	92
Good	85	91	93	96	97
	80	93	97	100	99
	75	97	101	102	103
Above-average	70	103	104	106	106
	65	106	106	111	109
	60	110	109	113	111
Average	55	112	111	117	113
	50	116	114	118	116
	45	118	117	120	117
Below-average	40	121	120	121	119
	35	124	122	124	123
	30	127	127	126	127
Poor	25	129	130	127	129
	20	131	135	131	132
	15	135	138	133	136
Very poor	10	141	143	138	142
	5	148	146	147	148
	0	154	152	152	151

Source: Golding, Myers, and Sinning (1989, pp. 120-123).

APPENDIX C

NORMS, RATINGS, AND PERCENTILES FOR PERCENT BODY FAT FOR MALES

APPENDIX C

NORMS, RATINGS, AND PERCENTILES FOR PERCENT BODY FAT FOR MALES

Rating	Percentile	Ages (in years) 26-35	36-45	46-55	56-65
Excellent	100	8	10	12	15
	95	10	12	14	17
	90	12	14	16	18
Good	85	13	16	18	19
	80	14	17	19	20
	75	15	18	20	21
Above-average	70	16	19	21	22
	65	17	20	22	23
	60	18	21	23	24
Average	55	19	22	24	24
	50	20	23	24	25
	45	21	24	25	26
Below-average	40	22	25	26	26
	35	23	26	27	27
	30	24	26	28	28
Poor	25	25	27	29	29
	20	26	28	30	30
	15	28	29	31	31
Very poor	10	30	30	32	32
	5	32	32	34	34
	0	37	38	38	38

Source: Golding, Myers, and Sinning (1989, pp. 114-117).

APPENDIX D

NORMS, RATINGS, AND PERCENTILES FOR PERCENT BODY FAT FOR FEMALES

APPENDIX D

NORMS, RATINGS, AND PERCENTILES FOR PERCENT BODY FAT FOR FEMALES

Rating	Percentile	Ages (in years) 26-35	36-45	46-55	56-65
Excellent	100	13	15	18	18
	95	15	17	19	20
	90	18	19	22	23
Good	85	19	20	23	24
	80	20	21	24	25
	75	21	23	25	26
Above-average	70	22	24	26	28
	65	23	25	27	29
	60	23	26	28	30
Average	55	24	27	29	31
	50	25	28	30	32
	45	26	29	31	33
Below-average	40	27	30	32	34
	35	29	31	33	35
	30	30	32	34	36
Poor	25	31	33	36	36
	20	33	35	37	37
	15	35	36	38	38
Very poor	10	36	39	40	39
	5	39	41	42	42
	0	49	48	49	46

Source: Golding, Myers, and Sinning (1989, pp. 120-123).

APPENDIX E

CHOLESTEROL CLASSIFICATIONS FOR MALES AND FEMALES

APPENDIX E

CHOLESTEROL CLASSIFICATIONS FOR MALES AND FEMALES

Less than 200 mg/dl	Desirable blood cholesterol
200-239 mg/dl	Borderline-high blood cholesterol
240 mg/dl and greater	High blood cholesterol

Source: National Cholesterol Education Program (NCEP) (cited in Nieman, 1990, p. 293).

APPENDIX F

CLASSIFICATION OF BLOOD PRESSURE IN ADULTS

APPENDIX F

CLASSIFICATION OF BLOOD PRESSURE IN ADULTS

Diastolic blood pressure	
BP range (mm Hg)	Category
Less than 85	Normal
85-89	High-normal
90-104	Mild hypertension
105-114	Moderate hypertension
115 and greater	Severe hypertension
Systolic blood pressure when diastolic blood pressure is less than 90 mm Hg	
Less than 140	Normal
140-159	Borderline, isolated systolic hypertension
160 and greater	Isolated systolic hypertension

Source: The 1988 Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (cited in Nieman, 1990).

APPENDIX G

NORMS, RATINGS, AND PERCENTILES FOR RESTING HEART RATE FOR MALES

APPENDIX G

NORMS, RATINGS, AND PERCENTILES FOR RESTING HEART RATE FOR MALES

		Ages (in years)			
Rating	Percentile	26-35	36-45	46-55	56-65
Excellent	100	49	50	50	51
	95	52	53	53	52
	90	54	56	57	56
Good	85	57	60	59	59
	80	60	61	60	60
	75	61	62	63	61
Above-average	70	62	64	64	64
	65	64	65	65	65
	60	65	66	67	67
Average	55	66	68	68	68
	50	68	69	69	69
	45	70	70	71	71
Below-average	40	72	73	73	72
	35	73	74	75	73
	30	74	76	76	75
Poor	25	77	77	79	76
	20	78	80	80	79
	15	81	82	83	81
Very poor	10	84	86	85	84
	5	88	90	91	88
	0	94	96	97	94

Source: Golding, Myers, and Sinning (1989, pp. 114-117).

APPENDIX H

NORMS, RATINGS, AND PERCENTILES FOR RESTING HEART RATE FOR FEMALES

APPENDIX H

NORMS, RATINGS, AND PERCENTILES FOR RESTING HEART RATE FOR FEMALES

		Ages (in years)			
Rating	Percentile	26-35	36-45	46-55	56-65
Excellent	100	54	54	54	54
	95	55	56	56	56
	90	59	59	60	59
Good	85	60	62	61	61
	80	63	63	64	63
	75	64	64	65	64
Above-average	70	66	66	66	67
	65	67	68	68	68
	60	68	69	69	69
Average	55	69	70	70	71
	50	70	71	72	72
	45	71	72	73	73
Below-average	40	72	74	74	75
	35	74	76	76	76
	30	76	78	77	77
Poor	25	78	79	78	79
	20	80	80	81	80
	15	82	82	84	81
Very poor	10	84	84	85	85
	5	88	88	90	89
	0	94	92	96	96

Source: Golding, Myers, and Sinning (1989, pp. 120-123).

APPENDIX I

NORMS AND RATINGS FOR MUSCULAR STRENGTH FOR MALES AND FEMALES

APPENDIX I

NORMS AND RATINGS FOR MUSCULAR STRENGTH FOR MALES AND FEMALES

	Age (in years)				
Rating	20-29	30-39	40-49	50-59	60+
Men					
Excellent	> 1.26	>1.08	>0.97	>0.86	>0.78
Good	1.17 - 1.25	1.01 - 1.07	0.91 - 0.96	0.81 - 0.85	0.74 - 0.77
Average	0.97 - 1.16	0.86 - 1.00	0.78 - 0.90	0.70 - 0.80	0.64 - 0.73
Fair	0.88 - 0.96	0.79 - 0.85	0.72 - 0.77	0.65 - 0.69	0.60 - 0.63
Poor	<0.87	<0.78	<0.71	<0.64	<0.59
Women					
Excellent	>0.78	>0.66	>0.61	>0.54	>0.55
Good	0.72 - 0.77	0.62 - 0.65	0.57 - 0.60	0.51 - 0.53	0.51 - 0.54
Average	0.59 - 0.71	0.53 - 0.61	0.48 - 0.56	0.43 - 0.50	0.41 - 0.50
Fair	0.53 - 0.58	0.49 - 0.52	0.44 - 0.47	0.40 - 0.42	0.37 - 0.40
Poor	<0.52	<0.48	<0.43	<0.39	<0.36

Source: The Institute for Aerobics Research (cited in Gettman, 1988, p. 168).

APPENDIX J

NORMS, RATINGS, AND PERCENTILES FOR FLEXIBILITY

FOR MALES

APPENDIX J

NORMS, RATINGS, AND PERCENTILES FOR FLEXIBILITY

FOR MALES

		Ages (in years)			
Rating	Percentile	26-35	36-45	46-55	56-65
Excellent	100	25	24	23	21
	95	22	21	20	19
	90	20	19	19	17
Good	85	19	19	17	17
	80	18	17	17	15
	75	18	17	16	15
Above-average	70	17	17	15	13
	65	17	15	15	13
	60	16	15	14	13
Average	55	16	15	13	11
	50	15	14	12	11
	45	15	13	12	11
Below-average	40	14	13	11	9
	35	13	11	10	9
	30	12	11	10	9
Poor	25	12	11	9	7
	20	11	9	8	7
	15	10	9	7	5
Very poor	10	9	7	6	5
	5	7	5	4	3
	0	2	1	1	1

Source: Golding, Myers, and Sinning (1989, pp. 114-117).

APPENDIX K

NORMS, RATINGS, AND PERCENTILES FOR FLEXIBILITY FOR FEMALES

APPENDIX K

NORMS, RATINGS, AND PERCENTILES FOR FLEXIBILITY

FOR FEMALES

Rating	Percentile	Ages (in years) 26-35	36-45	46-55	56-65
Excellent	100	26	25	24	23
	95	24	23	22	21
	90	23	22	21	20
Good	85	22	21	20	19
	80	21	20	19	18
	75	20	19	18	18
Above-average	70	20	19	18	17
	65	19	18	17	17
	60	19	17	17	16
Average	55	18	17	16	15
	50	18	16	16	15
	45	18	16	15	15
Below-average	40	17	15	15	14
	35	16	15	14	13
	30	16	14	14	13
Poor	25	15	13	13	12
	20	14	12	12	11
	15	14	11	11	10
Very poor	10	13	10	10	9
	5	11	9	8	7
	0	8	6	4	3

Source: Golding, Myers, and Sinning (1989, pp. 120-123).

APPENDIX L

TESTWELL SCORE RATINGS

APPENDIX L

TESTWELL SCORE RATINGS

Score	Rating
90-100	Excellent
80-89	Good
70-79	Average
60-69	Fair
59 and less	Poor

Source: TestWell (National Wellness Institute, 1988, p. 5).

APPENDIX M

INFORMED CONSENT FOR FITNESS TESTING

APPENDIX M

INFORMED CONSENT FOR FITNESS TESTING

NAME:_____ NUMBER:_____

The purpose of this physical fitness testing is to measure and appraise the participant's cardiorespiratory function, percent body fat, blood cholesterol level, blood pressure, resting heart rate, muscular strength, and flexibility.

All data collected will be held in strict confidence. The researcher will guarantee subject confidentiality.

The cardiorespiratory function test will involve a submaximal bench step test that will last three minutes. Percent body fat will be analyzed by obtaining four skinfold measurements and performing the proper calculations. The blood cholesterol testing will involve drawing a sample of blood from the subject's arm and having that sample analyzed at a local hospital laboratory. All blood work will be done by certified professionals. Blood pressure will be determined by using a sphygmomanometer, a pressure cuff, and a stethoscope. The resting heart rate will involve auscultation with a stethoscope with the participant at rest. A maximum bench press exercise will measure the participant's muscular strength. Flexibility will be

measured using a sit-and-reach test which examines trunk flexion.

I understand that I am responsible for monitoring my own condition during all of these tests. Should any problems or unusual symptoms occur, I will tell the researcher and will cease participation immediately.

I understand that I am allowed to ask questions at any time pertaining to the tests, methods, or procedures being used and that I can terminate my participation in this study at any time.

I will not hold the researcher, the assistants, or Lee College responsible for any or all injuries or accidents that may occur during this physical fitness testing.

I understand that certain risks accompany physical fitness testing procedures, and I voluntarily choose to participate in this study.

_____ _____

Signature of Participant Date

_____ _____

Test Administrator Date

APPENDIX N

MIDDLE TENNESSEE STATE UNIVERSITY RESEARCH ETHICS COMMITTEE APPROVAL LETTER

APPENDIX N

MIDDLE TENNESSEE STATE UNIVERSITY RESEARCH ETHICS COMMITTEE APPROVAL LETTER

TO: Mr. Mark Wickam
% Dr. Penny
HPERS

FROM: Peter Heller PH
Chair, MTSU Research Ethics Committee

RE: Review: Use of Human Subjects

Date: December 28, 1990

The purpose of this memo is to inform you that the MTSU Research Ethics Committee has favorably evaluated your research proposal in terms of its ethical utilization of human subjects. Best of luck on the successful completion of your project.

APPENDIX O

DESCRIPTIVE STATISTICS FOR SAMPLE GROUPS BY PHYSIOLOGICAL VARIABLES

APPENDIX O

DESCRIPTIVE STATISTICS FOR SAMPLE GROUPS BY PHYSIOLOGICAL VARIABLES

Descriptive Statistics for Sample Population
by Physiological Variables
N = 75

Variable	Mean	Standard deviation
Cardiorespiratory function	116.43	17.18
Percent body fat	24.67	6.17
Total cholesterol	201.60	36.57
Systolic blood pressure	124.67	14.97
Diastolic blood pressure	75.87	9.03
Resting heart rate	72.01	9.80
Muscular strength	.58	.22
Flexibility	14.53	3.55
TestWell	80.92	6.51

Descriptive Statistics for Faculty
by Physiological Variables
N = 49

Variable	Mean	Standard deviation
Cardiorespiratory function	119.63	17.51
Percent body fat	25.54	6.73
Total cholesterol	201.94	37.85
Systolic blood pressure	125.78	15.78
Diastolic blood pressure	76.90	8.95
Resting heart rate	73.41	9.51
Muscular strength	.55	.23
Flexibility	14.04	3.58
TestWell	81.50	5.86

Descriptive Statistics for Administration and Staff
by Physiological Variables
N = 26

Variable	Mean	Standard deviation
Cardiorespiratory function	110.54	15.17
Percent body fat	23.03	4.63
Total cholesterol	200.96	34.73
Systolic blood pressure	122.58	13.36
Diastolic blood pressure	73.92	9.04
Resting heart rate	69.39	9.97
Muscular strength	.62	.21
Flexibility	15.46	3.35
TestWell	79.83	7.58

Descriptive Statistics for Males
by Physiological Variables
N = 48

Variable	Mean	Standard deviation
Cardiorespiratory function	113.70	17.17
Percent body fat	22.79	5.16
Total cholesterol	205.02	34.56
Systolic blood pressure	129.73	14.65
Diastolic blood pressure	79.79	7.71
Resting heart rate	71.40	10.38
Muscular strength	.68	.20
Flexibility	14.00	3.42
TestWell	82.03	5.78

Descriptive Statistics for Females
by Physiological Variables
N = 27

Variable	Mean	Standard deviation
Cardiorespiratory function	121.19	16.46
Percent body fat	28.02	6.49
Total cholesterol	195.52	39.83
Systolic blood pressure	115.67	10.90
Diastolic blood pressure	68.89	6.76
Resting heart rate	73.11	8.74
Muscular strength	.39	.12
Flexibility	15.48	3.64
TestWell	78.95	7.34

Descriptive Statistics for Males, Ages 26-35,
by Physiological Variables
N = 8

Variable	Mean	Standard deviation
Cardiorespiratory function	107.75	11.26
Percent body fat	19.25	5.17
Total cholesterol	174.25	14.61
Systolic blood pressure	122.75	10.20
Diastolic blood pressure	73.75	3.62
Resting heart rate	65.63	10.11
Muscular strength	.80	.17
Flexibility	16.13	2.10
TestWell	80.65	6.67

Descriptive Statistics for Males, Ages 36-45,
by Physiological Variables
N = 19

Variable	Mean	Standard deviation
Cardiorespiratory function	113.39	17.31
Percent body fat	21.70	4.69
Total cholesterol	206.05	31.35
Systolic blood pressure	125.00	11.39
Diastolic blood pressure	78.95	5.67
Resting heart rate	72.95	9.00
Muscular strength	.75	.21
Flexibility	14.32	3.22
TestWell	81.32	4.98

Descriptive Statistics for Males, Ages 46-55,
by Physiological Variables
N = 13

Variable	Mean	Standard deviation
Cardiorespiratory function	122.15	20.52
Percent body fat	26.55	3.93
Total cholesterol	215.62	36.48
Systolic blood pressure	130.15	11.53
Diastolic blood pressure	80.62	9.00
Resting heart rate	73.39	8.38
Muscular strength	.59	.17
Flexibility	13.08	3.57
TestWell	82.08	4.34

Descriptive Statistics for Males, Ages 56-65,
by Physiological Variables
N = 7

Variable	Mean	Standard deviation
Cardiorespiratory function	106.71	12.27
Percent body fat	23.93	4.17
Total cholesterol	224.29	34.71
Systolic blood pressure	145.43	18.10
Diastolic blood pressure	84.86	7.38
Resting heart rate	66.00	10.52
Muscular strength	.52	.10
Flexibility	12.71	4.35
TestWell	83.33	7.42

Descriptive Statistics for Females, Ages 26-35,
by Physiological Variables
N = 12

Variable	Mean	Standard deviation
Cardiorespiratory function	119.00	18.95
Percent body fat	25.78	5.39
Total cholesterol	187.83	38.18
Systolic blood pressure	108.92	7.76
Diastolic blood pressure	65.50	5.05
Resting heart rate	74.17	10.78
Muscular strength	.43	.13
Flexibility	15.83	3.71
TestWell	76.71	8.06

Descriptive Statistics for Females, Ages 36-45,
by Physiological Variables
N = 7

Variable	Mean	Standard deviation
Cardiorespiratory function	126.00	11.68
Percent body fat	28.51	6.63
Total cholesterol	180.00	29.33
Systolic blood pressure	116.86	7.38
Diastolic blood pressure	70.86	6.31
Resting heart rate	72.86	5.73
Muscular strength	.36	.10
Flexibility	16.43	1.90
TestWell	81.20	4.51

Descriptive Statistics for Females, Ages 46-55,
by Physiological Variables
N = 5

Variable	Mean	Standard deviation
Cardiorespiratory function	132.60	1.34
Percent body fat	33.49	5.75
Total cholesterol	233.60	39.51
Systolic blood pressure	126.00	12.41
Diastolic blood pressure	74.40	8.30
Resting heart rate	74.80	9.34
Muscular strength	.30	.08
Flexibility	12.80	1.48
TestWell	80.84	5.29

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