THE RELATIONSHIP BETWEEN SUBMAXIMAL AEROBIC CAPACITY AND BLOOD LIPIDS IN A FEMALE POPULATION

By

GRAYDON HARRIS YOHE

Bachelor of Science

Oklahoma State University

Stillwater, Oklahoma

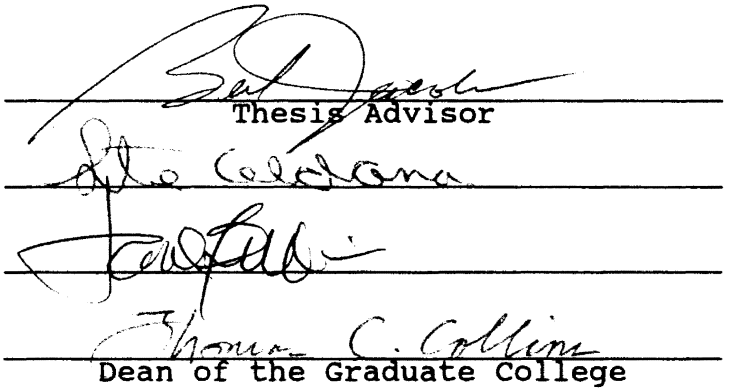
1991

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
May 1993

OKLAHOMA STATE UNIVERSITY

THE RELATIONSHIP BETWEEN SUBMAXIMAL
AEROBIC CAPACITY AND BLOOD LIPIDS
IN A FEMALE POPULATION

Thesis Approved:



Thesis Advisor

Dean of the Graduate College

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to my graduate committee: Dr. Bert Jacobson, Dr. Frank Kulling, and Dr. Steven Aldana. Their constant guidance and advisement allowed a successful completion to this project. I would like to extend special thanks to Dr. Steven Aldana, whose patience and knowledge are beyond his years.

I would also like to thank the Oklahoma State University Wellness Center and its administrators for their technological and financial sponsorship.

Thanks also to Aouni Hallal and Scott Tyson for their computer brilliance.

Special thanks to the graduate assistants in the laboratory. Who, with their humor and assistance, kept me focused and motivated.

Lastly, I would like to thank my family and my girlfriend, Gretchen. Without their constant love, understanding, and moral support, this project would not have been completed.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Cardiovascular disease, specifically coronary heart disease (CHD), is the leading cause of death in the United States. With over 500,000 deaths and another 6 million persons with symptoms, CHD costs over $50 billion in health care and lost productivity annually (5). Despite substantial success in reducing premature death due to CHD, the pool of knowledge concerning risk factor interaction is considered general at best. More studies regarding specific risk factor interaction are required to determine the optimal level of protection from CHD.

CHD is caused by atherosclerosis, the build up of plaque that results in the narrowing of the arteries that supply blood to the heart. Atherosclerosis begins when cholesterol and other lipids combine with cellular reactions to thicken arterial walls. This process gradually continues to reduce the lumen of the artery and restrict blood flow (1,5). The process reaches critical levels when the heart does not receive adequate supplies of blood and oxygen. The resultant lack of blood flow causes injury or death to myocardial cells, therefore, causing permanent damage to the heart muscle. In some cases, the extent of cardiac damage can result in death.

The risk factors which contribute to the atherosclerotic process can be broken down into two

categories, non-modifiable and modifiable.

Family history of heart disease, increasing age, and male gender are non-modifiable risk factors which have been documented to increase the risk of CHD (29,35,36). However, recent trends have shown women closing the gap to men as age increases (17,27). Estrogen and hormone imbalance are thought to be major contributors to this current trend (17,27).

Modifiable risk factors are lifestyle related and can be either environmental or social. The primary modifiable risk factors are smoking, hypertension, and hypercholesterolemia (29,35,36). Although only these three have been mentioned as primary, it is necessary to note that many covariates influence the effect and intensity of each risk factor.

Covariates that can affect primary risk factors include obesity (% of body fat or body mass index), stress, high-fat diet, alcohol consumption, hormone levels, and physical activity (29,35,36). The primary focus of this study will be the effect of exercise on cholesterol, while controlling for the covariates that may have an influence on the results.

Cholesterol is a fat-like substance (lipid) that is a key component of cell membranes and a precursor of bile acids and steroid hormones. Typical of lipids, cholesterol is not water-soluble. In order to be transported through the body, the cholesterol must bind with a protein macromolecule to form a lipoprotein (1). There are several combinations of lipoproteins; high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very low-density

lipoprotein (VLDL). HDL cholesterol is commonly termed the "good" cholesterol, while LDL and VLDL is considered to be the "bad" cholesterol.

HDL is considered "good" because research shows it takes up cholesterol from the bloodstream and delivers it to the liver to form bile acids (1). The result of this process is the reduction of plaque on the arterial walls. Many studies have documented an inverse relationship between HDL and CHD (9,10,21-23).

LDL and VLDL is considered "bad" because when transporting cholesterol to various body cells, the cholesterol is deposited on the blood vessel for use. As a result, when LDL levels are excessively high, cholesterol begins to accumulate and restrict blood flow (1,21-23,29).

As mentioned earlier, a major concern in today's society is the increasing incidence of CHD in women. The exact cause of this trend has yet to be determined, but theories tend to identify the relationship between menopause and oral contraceptive use to cholesterol as major factors in this process (17,18,27,31). Exercise has been proposed as a possible solution to this problem. As a result, this study will examine the interaction of physical fitness and cholesterol in a female population.

Purpose of the Study

The knowledge of the interaction between levels of fitness, cholesterol, and the confounding covariate risk factors is currently limited, especially in the female population. The purpose of this study was to determine

the relationship between three fitness levels and blood lipids, specifically total cholesterol (TC) and HDL-C, in a female population.

Hypotheses

There will be no statistical significant difference in TC and fitness levels in females after control for possible confounding variables.

There will be no statistical significant difference in HDL-C and fitness levels in females after control for possible confounding variables.

Extent of the Study

Delimitations

1. The study will involve employed female adults.
2. The study will involve females living in the same geographical area.

Limitations

1. The subjects will be limited to only those completing all relevant questions on the health risk appraisal questionnaire and completing clinically-measured data.
2. The study will use first-time visit data only.
3. The study will not attempt to control for amount of cholesterol in the diet.
4. The subjects are self-selected, in that enrollment in the health promotion program is on a voluntary basis. The subjects do, however, receive incentives to participate in the program.

Assumptions

1. The health risk appraisal questionnaire is valid and reliable.
2. The clinically-measured data was collected using correct protocol and procedure.

Definitions

Conceptual

Aerobic Capacity: The rate at which oxygen can be consumed during exercise at sea level. Also known as VO2 max, functional capacity, and oxygen uptake. Usually measured in milliliters per kilogram of body weight.

Atherosclerosis: A very common form of arteriosclerosis, in which the arteries are narrowed by deposits of cholesterol and other material in the inner walls of the artery. It is the type of arteriosclerosis most influenced by lifestyle.

Cholesterol: A steroid alcohol found in animal fats. This pearly, fat-like substance is implicated in the narrowing of the arteries in atherosclerosis.

Coronary heart disease (CHD): Atherosclerosis in the arteries that supply oxygen to the the heart muscle.

High-density lipoprotein (HDL): Cholesterol is carried by the high-density lipoprotein to the liver. The liver then uses the cholesterol to form bile acids which are excreted. This form is commonly termed "good" cholesterol.

Lipids: A general term used for several different compounds which include both solid fats and liquid oils. There are three major classes of lipids: triglycerides,

phospholipids, and sterols.

Lipoprotein: The carrier protein for lipids. There are three types of lipoproteins: HDL, LDL, and VLDL.

Low-density lipoprotein (LDL): Transports cholesterol from the liver to other body cells. LDL is often referred to as "bad" cholesterol because it has been implicated in the development of atherosclerosis.

Functional

Aerobic Capacity: Amount of oxygen consumed during a submaximal bicycle ergometry test. Can be used to classify individuals into fitness categories.

Health Risk Appraisal (HRA): An instrument used to identify health risks and quantify the amount of risk for each risk factor. Commonly used in corporate health promotion programs, in conjunction with consultation, as preventive medicine.

Percent of Body Fat: Percentage of fat, in relation to lean body mass, in the body. Can be measured by several different instruments, but is most commonly measured by skinfold protocols.

CHAPTER II

A SELECTED REVIEW OF LITERATURE

The text of Chapter I was a description of the CHD risk factors. In this chapter, the research behind cholesterol and CHD and the resulting implications of physical fitness are explored and discussed.

Review of Recent Studies: CHD and Cholesterol

The relationship between cholesterol and CHD has been known for nearly a century (35). The most successful longitudinal study is the Framingham Heart Study. The results of that study have played a major role in explaining the nature of CHD risk factors and their relative importance (36). Other significant studies that have documented the relationship between cholesterol and CHD include the Lipid Research Clinics Prevalence Mortality Follow-up Study (LRCF), the Lipid Research Clinics Coronary Primary Prevention Trial (LRC-CPPT), and the Multiple Risk Factor Intervention Trial (MRFIT). All of these studies have provided an abundance of epidemiologic information that has contributed to the knowledge of risk factors directly associated with an increased risk for the development of CHD (21-23,29).

Studies by Leaf et al. (17) and Matthews et al. (27) document the growing trend of CHD in women. Leaf examines

the effect of oral contraceptive use, while Matthews studied the onset of menopause (17,27). Both have significantly correlated with increasing incidence of CHD.

Review of Recent Studies: Cholesterol and Physical Fitness

The current literature focusing on the relationship between cholesterol and physical activity is equivocal in both men and women. The studies that have found significant reductions in TC and increases in HDL-C characteristically have involved high intensity exercise or superior fitness levels (4,13,38).

In contrast, many of the reviews found an insignificant reduction in TC but a significant increase in HDL-C (2,7,8,11,14,19,20,25,26,28,31,33,39). It is important to note that a substantial number of the studies selected males as the sample population, while very few of the studies involve females as the subjects. As a result, current knowledge of the complete relationship between cholesterol and exercise in females is minimal. The few studies involving only women have shown promise in reducing TC, in addition to, increasing HDL-C (24,32).

In general, the studies involving strictly men have shown no significant change in TC and increases in HDL-C (2,7,8,11,39). The exceptions to this rule include studies by Blair et al. (4), Wood et al. (38), and Hellsten et al. (13). All of these studies reported decreases in TC and increases in HDL-C. The design of these studies involved either intense physical activity or an excellent fitness category rating (VO2 of above 52 ml/kg/min), in

addition to, strict control over age, diet, and body composition.

Review of Recent Studies: Women only

A study by Lochen et al. (24) was designed to measure differences between fitness levels and physical activity with TC and HDL-C in females. In the study, self-reported levels of physical activity and clinically-measured fitness levels were used for data, while controlling for age, smoking, and body mass index (BMI). The results indicated significant differences in TC and HDL-C between fitness levels but only HDL-C significance for physical activity.

Another study by Owens et al. (32), involved measuring activity by the Paffenbarger Activity Questionnaire and comparing the levels with TC and HDL-C. The study controlled for age, education, and BMI. The results indicated that when women reported energy expenditure of over 2000 Kcal per week, decreased TC and increased HDL-C was observed.

A study conducted by Bauman and Owen (2) examined the relationship between physical activity and cholesterol. The study classified the participants' activity levels as aerobic, moderate, or inactive; while controlling for age and education. Before statistical control, significance was found between both TC and HDL-C for both aerobic and moderate activity levels. After control was added, TC reduction became insignificant, but the relationship between aerobic and HDL-C remained significant.

In another study by Farrell and Barboriak (8),

exercise was specifically prescribed and defined, then the relationship to cholesterol was examined. The design of this study was to expose participants to an eight week endurance program, which included exercise at 70% of VO2 max, for 30 minutes, 3-4 times per week, while controlling for age and percent of body fat. The testers observed an initial significant reduction of TC, which after four weeks leveled off and became insignificant. The relationship between HDL-C and exercise continued to increase linearly as fitness increased. This same occurrence was documented in a report by Kiens et al. (14).

Review of Recent Studies: Covariates

Studies which have documented significant relationships between covariates and cholesterol are discussed in the following section.

In a study conducted by Hartung et al. (12), the effect of alcohol and exercise on TC and HDL-C in women was examined. The results found significant effects of both exercise and alcohol on HDL-C. Insignificant benefits were noticed in exercise but not in alcohol for TC. Exercise was found to be the more important determinant in increasing HDL-C.

A study by Tucker et al. (37) examined the relationship between TC, HDL-C, and stress. Tucker found that stress and TC were directly related but noted no significant difference in HDL-C.

Matthews et al. (27) conducted a study examining the relationship between menopause and CHD risk factors. The results of the study indicate that following the onset of

menopause, HDL-C levels decline, LDL-C levels increase, and TC levels increase. This suggests that menopause has an unfavorable effect on CHD risk.

Another study conducted by Leaf et al. (17) examined the effect of oral contraceptive use and CHD risk factors. The results of this study revealed no significant difference between oral contraceptive use and TC levels but did report a significant difference in HDL-C levels. The levels of HDL-C were significantly lower in females using oral contraceptives.

In 1992, Haertel et al. (11) conducted a study examining the relationship between HDL-C and employment in females. The study controlled for age, body mass, smoking, alcohol consumption, oral contraceptives, and pregnancy. The results of the test indicated that HDL-C levels of employed females were significantly higher than unemployed females. The relationship between TC and employment was insignificant.

In two studies by Linn et al. (19,20), the relationship between socioeconomic status (SES) and lipid levels was examined. The results were dependant upon race. In whites, HDL-C levels were directly related to SES. In contrast, HDL-C and SES were inversely related in blacks. There was no significant difference noted in TC.

In a different study by Krummel et al. (15), TC and HDL-C were examined in relation to a high-fat diet. The percentage of the diet that came from fat was between 35% and 45%. The results of the study indicated that there was a direct relationship between fat intake and TC and HDL-C.

CHAPTER III

METHODOLOGY

Research Design

This study was designed as a retrospective, cross-sectional study. The focus of the study was on the relationship between blood lipids, specifically TC and HDL-C, and fitness levels in females. The study examined the difference with and without statistical control for the following variables: age, body composition, smoking status, dietary fat intake, stress, family history, SES, use of oral contraceptives, and the onset of menopause.

Population

The sample size for this study was approximately 575 adult females. The subjects are all employed at one of several large Southwest corporations, the average age of the sample was 36.5 years old, and 65% of the sample was married. The majority of the subjects were white (87%) and the average family income was approximately $28,000. A complete demographic profile is illustrated in Table I.

Procedures

The data for this study was collected from a health risk appraisal (HRA) completed by the sample population as

TABLE I

DEMOGRAPHIC PROFILE

	TC	HDL-C	
Sample Size	n= 575	n= 571	
RACE	Percent		Mean
Caucasian	87.7%		
Black	2.0%		
American Indian	1.3%		
Oriental	.6%		
Hispanic	7.7%		
Other	.8%		
MARITAL STATUS			
Single	35%		
Married	65%		
AGE			36.5
BODY COMPOSITION			30.2%
INCOME			$28,000

part of a voluntary corporate health promotion program.

Each participant was required to complete a HRA questionnaire prior to their initial laboratory examination. The questionnaire included self-reported responses concerning age, smoking history, alcohol consumption, stress, history of family heart disease, diet, socioeconomic status (SES), use of oral contraceptives, and menopause.

Laboratory data that was clinically-measured included a submaximal fitness test, body composition test (by skinfold), and a lipid profile, which includes TC and HDL-C levels. All of the data was gathered by qualified physician assistants or certified exercise test technologists.

Instrumentation

The data for smoking, alcohol, family history, SES, menopause, and oral contraceptive were gathered categorically, while age, fitness levels, body composition, dietary fat, and stress variables were collected as continuous variables for statistical analysis. The structure of the categorical variables is included in the following paragraphs and the complete questionnaire is included in Appendix A.

Smoking status was classified into three categories; never smoked, quit smoking, and currently smoking. The alcohol consumption was classified into three categories; never drank, $\leq$ two drinks per week, and $\geq$ three drinks per week. SES was broken down into four categories; < \$10,000, \$10-\$20,000, \$20,001-\$40,000, and > \$40,000.

Questions concerning family history of heart disease, menopause, and oral contraceptive use were categorized as simple yes or no responses.

The clinically-measured data for aerobic capacity was measured utilizing the Biogard 990 bicycle ergometer and the submaximal Astrand-Ryming protocol to determine submaximal fitness levels (34). This protocol was chosen because of its wide-spread use and relative low cost of testing many subjects. The aerobic capacity level was measured in milliliters of oxygen consumed per kilogram of body weight per minute (O2 ml/kg/min). The level attained was then broken down into three fitness categories established by Cooper (6): 1) Participants who scored in the poor or very poor fitness category. 2) Participants who scored in the fair or good fitness category. 3) Participants who scored in the excellent or superior fitness category. An illustration of Cooper's fitness categories can be found in Appendix B.

For ease of description, the very poor to poor category was labeled the low fitness category, the fair to good category was labeled average, and the excellent to superior category was labeled the high fitness category.

Body composition was measured using Harpenden skinfold calipers and a sum of three-sites protocol. The subcutaneous fat was measured at the chest, suprailiac, and the thigh. Following the measurement, the total millimeters of skinfold thickness was tabulated and compared to gender and age tables to determine the percentage of body fat (3).

The total cholesterol and high-density lipoprotein cholesterol levels were measured following a six hour fast. The TC and HDL-C levels were calculated using the Kodak Ektachem analyzer, which uses an enzymatic process to derive TC and HDL-C.

Statistical Analysis

The statistical analysis system (SAS) was utilized to conduct an analysis of variance (ANOVA) and analysis of covariance (ANCOVA) between fitness levels, TC and HDL-C. The ANOVA examined the difference between fitness levels, TC, and HDL-C without statistical control for covariates, while the ANCOVA examined the same relationship with statistical control. Following the initial test, Duncan's post-hoc test for specific differences between groups was used in the ANOVA and the least Square Means (LSMEANS) method was utilized to determine differences between groups in the ANCOVA.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to test the null hypotheses that there would be no significant difference between fitness levels, TC, and HDL-C levels in females, after adjusting for the confounding covariates. The fitness levels were grouped into three categories according to Cooper (10).

An analysis of variance (ANOVA) was used to determine the difference among lipids and fitness levels without statistical control for covariates. Following the ANOVA, an analysis of covariance (ANCOVA) was utilized to evaluate the same relationship with statistical control over covariates. The results of these statistical tests are listed in the following paragraphs.

Results of the ANOVA

The results of the ANOVA indicated a significant difference in HDL-C and TC measures between fitness levels. Following the ANOVA, Duncan's post-hoc test for differences between groups indicated significant difference in TC between the low to high and between the moderate to high fitness categories; no difference was found between the low and moderate categories. The results of the ANOVA can be observed in Table II.

TABLE II

ANALYSIS OF VARIANCE

	Fitness Levels							
	Low		Average		High			
Variable	Mean	SD	Mean	SD	Mean	SD	F-value	p-value
TC	212.3_a	44.6	205.5_a	38.2	188.1_b	37.8	24.37	0.0001
HDL-C	49.6_a	11.7	53.1_b	13.0	56.3_c	13.5	16.52	0.0001

TC = total cholesterol in mg/dL
HDL-C = high density lipoprotein cholesterol in mg/dL

note: means with the same letter subscripts are not statistically significant

Results of the ANCOVA

The results of the ANCOVA indicated that the differences between HDL-C and fitness levels was significant. Using the LSMEANS method of follow-up, the low to high and moderate to high categories were identified as significant. The test results were insignificant in comparing HDL-C levels between the low and moderate fitness categories. The test also yielded insignificant reductions of TC between all levels of fitness. The results of the ANCOVA can be observed in Table III.

TABLE III

ANALYSIS OF COVARIANCE

	Fitness Levels							
	Low		Average		High			
Variable	Mean	SD	Mean	SD	Mean	SD	F-value	p-value
TC*	205.6_a	8.2	204.9_a	7.9	199.8_a	7.5	7.18	0.2017
HDL-C*	54.3_a	2.6	55.6_a	2.5	58.7_b	2.4	7.53	0.0022

TC = total cholesterol in mg/dL
HDL-C = high density lipoprotein cholesterol in mg/dL

note: means with the same letter subscripts are not statistically significant

*note: means were adjusted for age, body composition, smoking, stress, diet, alcohol, family history, income, menopause, and oral contraceptive use

Discussion

This study compared fitness levels and lipid levels in a female population. The results were consistent with the majority of the other studies that examined exercise and cholesterol in females (2,8,14). HDL-C was significantly increased by high fitness, while the relationship between TC and fitness remained insignificant. Possible scenarios and mechanisms for these results are discussed in the following paragraphs.

The ANOVA examined the difference between fitness levels to TC and HDL-C without statistical control for covariates. As a result, the ANOVA accounted for 7% of the variance in TC and 5% of the variance in HDL-C, which indicated fitness was a significant contributor to cholesterol.

The ANCOVA examined the same relationship between fitness levels to TC and HDL-C with statistical control. This accounted for 16% of the total variance in TC and 17% of the variance in HDL-C. The means for TC and HDL-C, as related to each covariate, can be observed in Appendix C. In addition, the F-values and p-values for each covariate can be observed in Appendix D.

There are many possible explanations for the variance that was not accounted for in our study. For example, genetic disposition, cholesterol in the diet, stress, medications, and stage of menstrual cycle.

Although attempts were made to control for genetics, diet, and stress; the subjective nature of the self-reported questions and lack of complete information

prevented a thorough determination of variance.

Also, the study made no attempt to control for medications or stage of the menstrual cycle. Both of which have been documented to have a significant effect on cholesterol. Faber et al. (33) documented the change of cholesterol relative to the stage of the cycle. The conclusion was that when estrogen levels are high, cholesterol levels consistently decrease.

HDL-C and Fitness:

HDL-C was significantly increased by high levels of fitness. The precise mechanism which promotes this positive influence has not yet been identified, but leading theories tend to support the change in lipase profile as the primary cause (30).

Exercise acts to promote the activity of the lipoprotein lipase (LPL) and lecithin: cholesterol acyltransferase (LCAT), while inhibiting hepatic lipase (HL). The role of LPL in the body is to increase the utilization of fatty acids by muscle cells. The role of LCAT is to mature the HDL-C particle. And, in contrast, HL acts to eliminate HDL-C from circulation. In conclusion, increased levels of LPL and LCAT and decreased levels of HL have been observed in subjects who engage in regular aerobic activity (30). This provides a positive effect in reducing the risk of CHD.

TC and Fitness:

The difference between all levels of fitness and TC was found to be statistically insignificant. However, it

is important to note that their was an insignificant reduction in TC as fitness levels increased. This observed difference should be considered both encouraging and beneficial in helping to reduce CHD.

Prominent factors that may have skewed the results between fitness levels and TC include the reported percentages of the onset of menopause or the use of oral contraceptives. The percentages were 1.6% and 5.1%, respectively. It is possible that these low percentages can be attributed to the mean age of the sample size (36.5) and the marital status of subjects (65% married).

As a result, neither measurement provides an accurate indication of the effect of menopause or the use of oral contraceptives on cholesterol. The rationale is that the onset of menopause does not occur until approximately the age of 50 and the incidence of oral contraceptives in married couples is relatively low. Therefore, the true affect of these covariates may be concealed in this study.

In conclusion, this study found no significance in TC and fitness, but in an older population, may have had a more significant affect on cholesterol in females with low estrogen levels.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Summary

The recent increase of CHD in older women indicates a need for further study into the risk factors of heart disease in the female population. This study specifically examined the relationship between fitness levels to TC and HDL-C

The data collected in the study was analyzed by the following methods:

1. ANOVA with Duncan's follow-up between fitness levels, TC, and HDL-C.

2. ANCOVA with LSMEANS between fitness levels, TC, and HDL-C.

Findings

Based on the hypotheses stated and the limits of this study, the data yielded the following findings:

1. There was no significant difference between TC and all fitness levels.

2. There was no significant difference between HDL-C and the low to moderate fitness levels.

3. There was a significant difference between HDL-C and the low to high and moderate to high fitness levels.

Conclusions

In consideration of the results, the conclusion that high fitness levels have a positive effect on HDL-C can be stated. Although the results cannot be generalized due to employment and location variables, the study does reveal that females who engage in regular aerobic exercise by standard guidelines can reduce their risk for CHD.

Recommendations

It is recommended by this researcher that females engage in regular aerobic activity in such a way, as to safely attain a high fitness level that would reduce the risk of CHD.

In addition, this researcher recommends continued research between cholesterol and physical fitness. Due to the impossibility of controlling completely for genetic disposition and the subjective nature of self-reported answers, the covariate effect of lipids is difficult to quantify and adjust for statistically. Therefore, continued research is necessary to establish any new or changing relationships or evolving trends.

The following recommendations are presented as a result of this study as means to identify future relationships between fitness levels and lipids:

1. Longitudinal studies with more objective control over covariates. This would eliminate the impurities of cross-sectional studies and provide more reliable information on covariate interaction.

2. Studies involving a more diverse female

population, such as chronological age, employment status, marital status, and location.

3. Studies involving the interaction of estrogen on cholesterol, specifically oral contraceptive use and onset of menopause.

A SELECTED BIBLIOGRAPHY

1. American Medical Association. Home Medical Encyclopedia. New York: Randon House, 1989.

2. Bauman, A. and Owen, N. (1991). Habitual physical activity and cardiovascular risk factors. The Medical Journal of Australia 154(1): 22-28.

3. Baun, B., Baun, R., Raven, P. (1981). A normagram for the estimate of percent body fat from generalized equations. Research Quarterly for Exercise and Sport 52: 380-384.

4. Blair, S.N., Jacobs, D.R., and Powell, K.E. (1985). Relationships between exercise or physical activity and other health behaviors. Public Health Reports 100: 195.

5. Consensus Conference. Lowering blood cholesterol to prevent heart disease. Journal of American Medical Association 253(14): 1985, pp.2372-2377.

6. Cooper, K. The Aerobics Way. New York: Bantam Books, 1977, pp. 280-281.

7. Danneberg, A.L., Keller, J.B., Wilson, P.W., and Castelli, W.P. (1989). Leisure time physical activity in the Framingham offspring study. American Journal of Epidemiology 129(1): 76-88.

8. Farrell, P.A. and Barboriak, J. (1980). The time course of alterations in plasma lipid and lipoprotein concentrations during eight weeks of endurance training. Atherosclerosis 27: 231.

9. Gordon, T., Castelli, W.P., Hjortland, M.C., et al. (1977). High-density lipoprotein as a protective factor against heart disease. American Journal of Medicine 62: 707-714.

10. Green, M.S., Heiss, G., Rifkind, B.M., et al. (1985). The ratio of plasma high-density lipoprotein cholesterol to total cholesterol and low-density lipoprotein cholesterol: The Lipid Research Clinics Primary Prevention Study. Circulation 72(1): 93-104.

11. Haertel, U., Heiss, G., Filipiak, B., and Doering, A. (1992). Cross-sectional and longitudinal associations between high-density lipoprotein cholesterol and women's employment. American

Journal of Epidemiology 135(1): 68-78.

12. Hartung, G.H., Reeves, R.S., Foreyt, J.P., Patsch, W., and Gotto, A.M. (1986). Effect of alcohol intake and exercise on plasma high-density lipoprotein cholesterol subfractions and apolipoprotein A-1 in women. American Journal of Cardiology 58: 148.

13. Hellsten, G. (1989). Lipids and endurance physical activity. Atherosclerosis 75(1): 93-94.

14. Kiens, B., Jorgensen, I., Lewis, S., Jensen, G., Lithell, H., et al. (1980). Increased plasma HDL-cholesterol and apo A-1 in sedentary middle-aged men after physical conditioning. European Journal of Clinical Investigation. 10: 203-209.

15. Krummel, D.A., Mashaly, M.A., and Etherton, P.M. (1992). Prediction of plasma lipids in a cross-sectional sample of young women. Journal of American Dietician Association 92(8): 942-948.

16. Larkin, F.A., Riddick, H.A., Basiotis, P.P., Sykes, K.E., and Pao, E.M. (1990). Dietary patterns of women smokers and non-smokers. Journal of American Dietician Association 90(2): 230-237.

17. Leaf, D.A., Bland, D., Schaad, D., Neighbor, W.E., and Scott, C.S. (1991). Oral contraceptive use and coronary risk factors in women. American Journal of the Medical Sciences 301(6): 365-368.

18. Linder, C.W., Durant, R.H., Jay, S., and Bryant-Pitts, N. (1989). The influence of oral contraceptives and habitual physical activity on serum lipids in black adolescents and young women. Journal of Adolescent Health Care 10(4): 275-282.

19. Linn, S., Fulwood, R., Carroll, M., Brook, J.G., Johnson, C., et al. (1991). Serum total cholesterol: HDL cholesterol ratios in U.S. white and black adults by selected demographic and socioeconomic variables. American Journal of Public Health 81(8): 1038-1043.

20. Linn, S., Fulwood, R., Rifkind, B., Carroll, M., Muesing, R., et al. (1989). High-density lipoprotein cholesterol levels among U.S. adults by selected demographic and socioeconomic variables. American Journal of Epidemiology 129(2): 281-294.

21. Lipid Research Clinics Program. The Lipid Research Clinics Coronary Primary Prevention Trial Results. I. Reduction in incidence of coronary heart disease. Journal of American Medical Association 251(3): (1984), pp. 351-362.

22. Lipid Research Clinics Program. The Lipid Research

Clinics Coronary Primary Prevention Trial Results. II. The relationship of reduction in incidence of coronary heart disease to cholesterol lowering. Journal of American Medical Association 251: (1984), pp. 365-374.

23. Lipid Research Clinics Program Epidemiology Committee. Plasma Lipid Distributions in Selected North American Populations: The Lipid Research Clinics Program Prevalence Study. Circulation 60(2): (1979), pp. 882-884.

24. Lochen, M.C. and Ramussen, K. (1992). The Tromso study: physical fitness, self-reported physical activity, and their relationship to other coronary risk factors. Journal of Epidemiology Community Health 46(2): 103-107.

25. MacDonald, S., Joffres, M.R., Stachenko, S., Horlick, L., Fodor, G., et al. (1992). Multiple cardiovascular disease risk factors in Canadian adults. Canadian Medical Association Journal 146(11): 2021-2029.

26. Marti, B., Suter, E., Riesen, W.F., Tschopp, A., Wanner, H.U., et al. (1990). Effects of long-term, self-monitored exercise on the serum lipoprotein and apolipoprotein profile in middle-aged men. Atherosclerosis 81(1): 19-31.

27. Matthews, K.A., Meilahn, E., Kuller, L.H., Kelsey, S.F., Caggiula, A.W., et al. (1989). Menopause and risk factors for coronary heart disease. New England Journal of Medicine 321(10): 641-646.

28. Meilahn, E.N., Kuller, L.H., Matthews, K.A., Wing, R.R., Caggiula, A.W., et al. (1991). Potential for increasing High-density lipoprotein cholesterol, subfractions HDL2-C and HDL3-C, and apoprotein A-1 among middle-age women. Preventive Medicine 20(4): 462-473.

29. Multiple Risk Factor Intervention Trial Research Group. Multiple Risk Factor Intervention Trial: Risk Factor Changes and Mortality Results. Journal of American Medical Association 248(12): (1982), pp. 1465-1477.

30. Nieman, D.C. Fitness and Sports Medicine: An Introduction. Palo Alto, California: Bull Publishing Company, 1990.

31. Owens, J.F., Matthews, K.A., Wing, R.R., and Kuller, L.H. (1992). Can physical activity mitigate the effects of aging in middle-aged women? Circulation 85(4): 1265-1270.

32. Owens, J.F., Matthew, K.A., Wing, R.R., and Kuller, L.H. (1990). Physical activity and cardiovascular risk: A cross-sectional study of

middle-aged premenopausal women. Preventive Medicine 19(2): 147-157.

33. Perry, A.C., Shaw, M.H., Hsia, L., Nash, M.S., Kaplan, T., et al. (1992). Plasma lipid levels in active and sedentary premenopausal females. International Journal of Sports Medicine 13(3): 210-215.

34. Siconolfi, S., Cullinane, E., Carleton, R., Thompson, P. (1982). Assessing VO2 max in epidemiologic studies: modification of the Astrand-Rhyming test. Medicine and Science in Sports and Exercise 14: 335-338.

35. Stein, E.A. (1990). Lipid risk factors and atherosclerosis: What do we measure? Scandinavian Journal of Clinical Labratory Investigation 198: 3-8.

36. Superko, H.R., Wood, P.D., Haskell, W.L. (1985). Coronary heart and risk factor modification: Is there a threshold? American Journal of Medicine 78: 826-838.

37. Tucker, L.A., Cole, G.E., and Friedman, G.M. (1987). Stress and serum cholesterol: A study of 7000 adult males. Health Values: Achieving high-level Wellness 11(3): 34-39.

38. Wood, P.D., Haskell, W., Klein, H., Lewis, S., Stern, M.P., et al. (1976). The distribution of plasma lipoproteins in middle-aged male runners. Metabolism 25: 1249-1257.

39. Zavaroni, I., Lapetra, A., Puzo, J., Pelegrin, J., Hermosilla, T., et al. (1989). Habitual leisure-time physical activity is associated with differences in various risk factors for coronary artery disease. Journal of International Medicine 226(6): 417-421.

APPENDIXES

APPENDIX A

HEALTH RISK APPRAISAL QUESTIONNAIRE

2 IDENTIFICATION

We need your name and address in order to return your educational report to you. Demographic data, social security number, age, height, weight, etc. are necessary to accurately develop your Health Assessment report and compare your health status to similar population types.

TODAY'S DATE
1 Month Day Year

LAST NAME
2 Please Print

FIRST NAME
3

MI
4

HOME ADDRESS
5 House or Box Number, Street

CITY
6

STATE
7

ZIP CODE
8

FOREIGN COUNTRY IDENTIFICATION
9 For individuals living outside the United States, enter your country's code.

3 DEMOGRAPHIC DATA

TELEPHONE
AREA | NUMBER
1

SOCIAL SECURITY NO.
2

WHEN WERE YOU BORN?
MO. | DAY | YR.
3

AGE
YEARS
4

HEIGHT
FEET | INCHES
5

WEIGHT
LBS.
6

RACE
7
- 1 Black
- 2 White
- 3 American Indian
- 4 Oriental
- 5 Hispanic
- 6 Other

MARITAL STATUS
8
- 1 Single
- 2 Married
- 3 Divorced
- 4 Widowed
- 5 Separated

SEX
9
- 1 Male
- 2 Female

FAMILY INCOME
10
- 1 Under $10,000/year
- 2 $10,000 - $20,000/year
- 3 $20,001 - $40,000/year
- 4 More than $40,000/year

HABITS AND LIFESTYLE

The following section on habits and lifestyle begins with your EATING HABITS. Your particular eating traits as well as those associated with exercise, smoking, alcohol use, trauma exposure, and how you handle stress all bear on your longevity and well-being.

4 EATING HABITS

YES	NO	Do you usually or generally-
○	○	Eat three meals a day?
○	○	Follow a weight reduction diet?
○	○	Follow a low cholesterol diet?
○	○	Tend to skip breakfast?
○	○	Eat snacks between meals or after supper?
○	○	Eat fried foods five or more times per week?
○	○	Have an intense fear of gaining weight?
○	○	Tend to have eating binges followed by self-induced vomiting or use of laxatives?
○	○	Follow a strict vegetarian (no milk, meat or eggs) diet?
○	○	Follow an ovo-lacto vegetarian (eat eggs, milk) diet?
○	○	Tend to eat excessively when exposed to stress?
○	○	Eat out five or more times per week?

Mark how often you eat the foods listed. Note that a SERVING is SMALL, about the amount in a frozen packaged meal or inflight meal. If you eat LARGER SERVINGS, COUNT AS TWO or more. There is an overlap in content between the following two sections; we account for this in analyzing your results.

For One Day — Servings Per Day

Type of Food	Don't Eat	Seldom Eat	1	2	3	4	5 or More
13 Fruit or fruit juices	○	○	○	○	○	○	○
14 Potatoes, turnips, carrots, parsnips	○	○	○	○	○	○	○
15 Leafy vegetables (lettuce, cabbage)	○	○	○	○	○	○	○
16 Rice, macaroni, pastas	○	○	○	○	○	○	○
17 Whole grain bread, rolls, cereals	○	○	○	○	○	○	○
18 White bread, rolls, regular cereals	○	○	○	○	○	○	○
19 Pie, cake, doughnuts, sweet rolls	○	○	○	○	○	○	○
20 Meat/meat substitutes (beef, pork, cheese, poultry, fish)	○	○	○	○	○	○	○
21 Legumes, nuts, peanut butter	○	○	○	○	○	○	○
22 Skim milk, 2% milk	○	○	○	○	○	○	○
23 Whole milk	○	○	○	○	○	○	○
24 Butter, margarine (teaspoons)	○	○	○	○	○	○	○
25 Soft drinks (regular, non-diet)	○	○	○	○	○	○	○
26 Caffeinated coffee, tea, cola	○	○	○	○	○	○	○
27 Beer, wine, or mixed drinks	○	○	○	○	○	○	○
28 Salt-shaker use	○	○	○	○	○	○	○
29 Potato chips, corn chips, french fries	○	○	○	○	○	○	○
30 Sugar (teaspoons)	○	○	○	○	○	○	○

For One Week — Servings Per Week

Type of Food	Don't Eat	Seldom Eat	1	2	3	4	5 or More
31 Beef or lamb	○	○	○	○	○	○	○
32 Pork, bacon, sausage	○	○	○	○	○	○	○
33 Hot dogs, lunchmeats, processed meats	○	○	○	○	○	○	○
34 Poultry, fish	○	○	○	○	○	○	○
35 Shrimp, lobster, clams	○	○	○	○	○	○	○
36 Eggs	○	○	○	○	○	○	○
37 Hard cheese, cottage cheese, soft cheese	○	○	○	○	○	○	○
38 Ice cream, milk shakes	○	○	○	○	○	○	○
39 Salad oil, sour cream, mayonnaise	○	○	○	○	○	○	○
40 Candy	○	○	○	○	○	○	○

5 EXERCISE HABITS

Mark the PHYSICAL ACTIVITY LEVEL usually required by your JOB or DAILY ROUTINE (a few occupations are shown as examples).

LOW			MODERATE			HEAVY		
○ 1	○ 2	○ 3	○ 4	○ 5	○ 6	○ 7	○ 8	○ 9
Office Work			Assembly Line			Lumberjack/Heavy Manual Labor		

YES	NO	Do you-
2 ○	○	Know how to monitor your exercise level by taking your pulse?
3 ○	○	Get regular vigorous exercise, such as jogging, for at least 20 minutes, 3 times per week?
4 ○	○	Get some type of REGULAR EXERCISE?

If "yes" for REGULAR EXERCISE, mark HOW OFTEN AND HOW LONG per session for each type. If "no", go to unit 6.

	Don't Do This	How Often (Times/week) 1	2	3	4	5+	How Long (Minutes/session) 15	30	45	60+
Aerobics	5 ○	○	○	○	○	○	24 ○	○	○	○
Walking slow (20 min/mile)	6 ○	○	○	○	○	○	25 ○	○	○	○
Walking fast (15 min/mile)	7 ○	○	○	○	○	○	26 ○	○	○	○
Jogging (10 min/mile)	8 ○	○	○	○	○	○	27 ○	○	○	○
Running (8 min/mile)	9 ○	○	○	○	○	○	28 ○	○	○	○
Cycling slow (6 mph)	10 ○	○	○	○	○	○	29 ○	○	○	○
Cycling fast (12 mph)	11 ○	○	○	○	○	○	30 ○	○	○	○
Swimming slow (25 yds/min)	12 ○	○	○	○	○	○	31 ○	○	○	○
Swimming fast (50 yds/min)	13 ○	○	○	○	○	○	32 ○	○	○	○
Racquet sports (doubles)	14 ○	○	○	○	○	○	33 ○	○	○	○
Racquet sports (singles)	15 ○	○	○	○	○	○	34 ○	○	○	○
Calisthenics	16 ○	○	○	○	○	○	35 ○	○	○	○
Dancing	17 ○	○	○	○	○	○	36 ○	○	○	○
Basketball, football or similar sport	18 ○	○	○	○	○	○	37 ○	○	○	○
Weight training	19 ○	○	○	○	○	○	38 ○	○	○	○
Golf or bowling	20 ○	○	○	○	○	○	39 ○	○	○	○
Downhill skiing	21 ○	○	○	○	○	○	40 ○	○	○	○
Cross country skiing	22 ○	○	○	○	○	○	41 ○	○	○	○
Rowing	23 ○	○	○	○	○	○	42 ○	○	○	○

6 SMOKING HABITS

Mark items that apply to SMOKING.

1 ○ I do not smoke and never have. If so, go to unit 7.
2 ○ I currently smoke cigarettes.
3 ○ I used to smoke cigarettes, but I stopped.
4 ○ I smoke a pipe/cigar and inhale 5 or more times per day.
5 ○ I would like to quit smoking.

If you have EVER SMOKED CIGARETTES, mark daily amount and total number of years you have smoked.

Daily Amount	Number of Years
6 ○ ½ pack/day or less	7 ○ Less than 1 year
○ ½ - 1 pack/day	○ 1 - 5 years
○ 1 - 2 packs/day	○ 6 - 10 years
○ 2 packs or more/day	○ More than 10 years

If you FORMERLY SMOKED CIGARETTES BUT STOPPED, mark number of years since you have stopped.

8 ○ 1 year	○ 5 years
○ 2 years	○ 6 years
○ 3 years	○ 7 years
○ 4 years	○ More than 7 years

7 STRESS AND FEELINGS

Mark any CHANGES you have experienced IN THE PAST YEAR.

- ○ Spouse died
- ○ Close family member died
- ○ Moved to a new town
- ○ Changed jobs
- ○ Son or daughter left home
- ○ You left home
- ○ Close friend died
- ○ Got divorced or separated
- 9 ○ Lost a lot of money
- 10 ○ Took on a lot of debt
- 11 ○ Got married
- 12 ○ Lost job or retired
- 13 ○ Close relationship ended
- 14 ○ Developed major health problem
- 15 ○ I had NONE of the above CHANGES.

Mark the ONGOING SITUATIONS that you often face.

- ○ Pressure at work, school
- ○ Medical problems
- ○ Facing deadlines
- ○ Financial problems
- ○ Sexual problems
- ○ Trouble with family
- ○ Meeting family demands
- 23 ○ Emotional problems
- 24 ○ Marital difficulties
- 25 ○ Trouble with relationships
- 26 ○ Trouble with co-workers
- 27 ○ Time management problem
- 28 ○ I face NONE of the above SITUATIONS.

Mark the WAYS you usually RESPOND TO STRESS.

- ○ Get more physical exercise
- ○ Take a hot bath, shower
- ○ Escape through reading, hobbies, social activities, music
- ○ Eat more
- ○ Drink more alcohol
- ○ Smoke more
- ○ Spend quiet time alone, relaxing
- 35 ○ Ventilate your feelings (let off steam)
- 37 ○ Talk things over with a relative or friend
- 38 ○ Use the "relaxation response" or other stress technique
- 39 ○ Meditate or pray
- 40 ○ Remain calm outside while getting upset inside
- 41 ○ Walk away from stressful situations when possible
- 42 ○ I respond in NONE of the above WAYS.

Mark the TRAITS that usually apply to you.

- 43 ○ Rapid speech
- 44 ○ Highly competitive
- 45 ○ Hard-driving
- 46 ○ Never late
- 47 ○ Impatient
- 48 ○ Rushed
- 49 ○ Interrupt others
- 50 ○ I have NONE of the above TRAITS.

Mark HOW OFTEN you have the REACTIONS or TENDENCIES listed.

M = Most of the time S = Some of the time R = Rarely or none of the time

	M	S	R			M	S	R	
51	○	○	○	Cold, sweaty palms	57	○	○	○	Trouble sleeping
52	○	○	○	Tight neck muscles	58	○	○	○	Fast, pounding heart
53	○	○	○	Cry easily	59	○	○	○	Queasy stomach, "butterflies"
54	○	○	○	Grind teeth	60	○	○	○	Clench jaws
55	○	○	○	Hands tremble	61	○	○	○	Unable to relax
56	○	○	○	Hyperventilate	62	○	○	○	Bounce, jerk foot

Mark HOW OFTEN you have the FEELINGS listed.

M = Most of the time S = Some of the time R = Rarely or none of the time

	M	S	R			M	S	R	
63	○	○	○	Sad, depressed	72	○	○	○	Lonely
64	○	○	○	Wish to end it all	73	○	○	○	Still tired after sleep
65	○	○	○	Tense, nervous	74	○	○	○	Worried
66	○	○	○	Unable to cope	75	○	○	○	Optimistic about future
67	○	○	○	Happy	76	○	○	○	Angry
68	○	○	○	Anxious, fearful	77	○	○	○	Inadequate
69	○	○	○	Trapped	78	○	○	○	Insecure
70	○	○	○	Forgetful	79	○	○	○	Irritable, grouchy
71	○	○	○	Confused	80	○	○	○	Unable to concentrate

8 ALCOHOL HABITS

A Mark items that apply to you regarding ALCOHOL USE.

1 ○ I do not drink alcohol and never have
2 ○ I used to drink alcohol, but stopped
3 ○ I CURRENTLY DRINK ALCOHOL

B If you CURRENTLY DRINK ALCOHOL, mark details. If not, go to 9. Mark the NUMBER OF DRINKS you have during a typical drinking OCCASION. (A drink is a bottle of beer, shot of whiskey, glass of wine, or equivalent).

4 ○ 0 - 2 drinks
○ 3 - 6 drinks
○ 7 - 10 drinks
○ More than 10 drinks

C Mark the usual number of DRINKS PER WEEK you currently have. Mark the total NUMBER OF YEARS you've been drinking alcohol.

Drinks per WEEK	Number of YEARS
5 ○ Less than 2 drinks/week	6 ○ Less than 1 year
○ 2 - 10 drinks/week	○ 1 - 5 years
○ 11 - 25 drinks/week	○ 6 - 10 years
○ 26 - 40 drinks/week	○ 11 - 20 years
○ More than 40 drinks/week	○ More than 20 years

D Mark items that apply to you.

I have or have had-

7 ○ A traffic violation related to drinking
8 ○ A tendency to keep drinking when others stop.
9 ○ Problems with family/friends due to alcohol.
10 ○ Legal or financial problems due to alcohol
11 ○ Forgotten what happened while drinking
12 ○ Been told I have a drinking problem
13 ○ A current desire to talk to someone about my drinking habits.
14 ○ NONE of the above CONDITIONS.

9 DRUGS

YES	NO	Do you or would you-
1 ○	○	Feel like you have a drug problem?
2 ○	○	Like to talk about your drug habits?

10 TRAUMA, ACCIDENT, OTHER HAZARDS

YES	NO	Do you-
1 ○	○	Drive after alcohol/drug use?
2 ○	○	Operate machinery after alcohol/drug use?
3 ○	○	Tend to exceed the speed limit?
4 ○	○	Ride with drivers who have been using alcohol or drugs?
5 ○	○	Know how to swim?
6 ○	○	Live in a violent crime area?

Indicate miles traveled yearly in a motor vehicle.

7 ○ 10,000 or less
○ 10,001 - 15,000
○ 15,001 - 20,000
○ More than 20,000

What percent of the time do you wear a seatbelt?

8 ○ 25% or less
○ 26% - 50%
○ 51% - 75%
○ More than 75%

SELF CARE AND TESTS

The following items ask about your self care practices and about tests you may or may not have had. Early detection of a serious illness allows you to get early treatment and decreases the risk of permanent disability or premature death.

11 SELF CARE

YES	NO	Have you-
1 ○	○	Ever had a chest x-ray?
2 ○	○	Had an abnormal chest x-ray?
3 ○	○	Ever had an EKG (electrocardiogram)?
4 ○	○	Had an abnormal EKG?
5 ○	○	Ever had an exercise EKG?
6 ○	○	Had an abnormal exercise EKG?

YES	NO	Do you-
7 ○	○	Seek advice from a physician if symptoms persist?
8 ○	○	Plan annual rectal exam or test for occult blood (trace blood in the stool) after age 40?

12 MEN (Women, go to Unit 13).

YES	NO	
1 ○	○	Do you examine your testicles for nodules once a month?

13 WOMEN (Men, go to Unit 14).

YES	NO	Do you or have you-
1 ○	○	Ever had a PAP test?
2 ○	○	Had a PAP test within past year?
3 ○	○	Had an abnormal PAP test in past?
4 ○	○	Plan annual PAP tests in future?
5 ○	○	Examine your breasts once a month for lumps?
6 ○	○	Have a breast exam by a doctor once yearly?

14 TESTS

If you've ever had these tests done, mark the most recent value. If you do not enter any value in this section, the national norms for your age, sex, and race will be used in your health evaluation.

Blood Pressure Systolic	Blood Pressure Diastolic	Total Cholesterol	HDL Cholesterol
1 ○ Never Done	2 ○ Never Done	3 ○ Never Done	4 ○ Never Done
○ 120 or less	○ 80 or less	○ 180 or less	○ 15 or less
○ 121 - 130	○ 81 - 85	○ 181 - 200	○ 16 - 20
○ 131 - 140	○ 86 - 90	○ 201 - 220	○ 21 - 30
○ 141 - 150	○ 91 - 95	○ 221 - 240	○ 31 - 40
○ 151 - 160	○ 96 - 100	○ 241 - 260	○ 41 - 50
○ 161 - 180	○ 101 - 110	○ 261 - 280	○ 51 - 60
○ 181 - 200	○ 111 - 120	○ 281 - 300	○ 61 - 70
○ 201 - 220	○ 121 - 130	○ 301 - 330	○ 71 - 80
○ 221 - 240	○ 131 - 140	○ 331 - 360	○ 81 - 90
○ Over 240	○ Over 140	○ Over 360	○ Over 90
○ Don't Know	○ Don't Know	○ Don't Know	○ Don't Know

PERSONAL HEALTH CONDITIONS

Mark details about any of your past or present health problems that have been diagnosed by a physician or other health professional. Such details are helpful in determining the stage of an illness and how well it is being managed. Many of the things you can do to prevent and detect problems can also aid in controlling diagnosed conditions.

15 YES ○ NO ○ Have you ever had any type of HEART DISEASE or heart problem?

If "yes" mark type. If "no" go to Unit 16.

- ○ Angina
- ○ Cardiac muscle disease
- ○ Congenital defect
- ○ Coronary disease
- ○ Enlarged heart
- ○ Heart attack
- ○ Heart failure
- ○ Rheumatic fever
- ○ Rhythm problem
- ○ Valve problem
- ○ Other

Mark traits that apply.

- ○ I follow medical advice for heart problem.
- ○ I have had coronary artery by-pass surgery.
- ○ I can exercise vigorously without symptoms.

16 YES ○ NO ○ Have you ever had HIGH CHOLESTEROL or blood fats?

If "yes" mark details. If "no", go to Unit 17.

Control level is generally-
○ Poor ○ Fair ○ Good

Highest cholesterol within past year-
○ Under 240 ○ 240-300 ○ Over 300
○ Not measured ○ Don't know results

Lowest HDL cholesterol within past year-
○ Under 30 ○ 30-50 ○ Over 50
○ Not measured ○ Don't know results

Mark traits that apply.

- ○ I get my cholesterol checked at least twice a year.
- ○ I follow medical advice for cholesterol.

17 YES ○ NO ○ Have you ever had HIGH BLOOD PRESSURE?

If "yes" mark details. If "no", go to Unit 18.

Control level is generally-
○ Poor ○ Fair ○ Good

Highest systolic pressure (top no.) within past year-
○ Under 180 ○ 180-220 ○ Over 220
○ Not measured ○ Don't know results

Mark traits that apply.

- ○ I get pressure checked at least four times a year.
- ○ I follow medical advice for high blood pressure.

18 YES ○ NO ○ Have you ever had DIABETES (sugar)?

If "yes", mark details. If "no" go to Unit 19.

○ Insulin dependent ○ Non-insulin dependent

Control level is generally-
○ Poor ○ Fair ○ Good

Highest blood sugar within past year-
○ Under 150 ○ 150-200 ○ Over 200
○ Not measured ○ Don't know

Mark traits that apply.

- ○ I check my urine sugar at least once a week.
- ○ I follow medical advice for diabetes.

19 YES ○ NO ○ Have you had any type of CANCER, leukemia, or lymphoma?

If "yes", mark type. If "no" go to Unit 20.

- ○ Bone
- ○ Breast
- ○ Cervix
- ○ Colon
- ○ Leukemia
- ○ Lung
- ○ Lymphoma
- ○ Melanoma
- ○ Ovary
- ○ Prostate
- ○ Skin cancer
- ○ Testicle
- ○ Urinary bladder
- ○ Uterus
- ○ Other
- ○ I have been free of CANCER for 5 or more years.

20 Mark any of the other ILLNESSES or MEDICAL PROBLEMS listed below that you have ever had.

- ○ Alcoholism
- ○ Sickle cell anemia
- ○ Bleeding trait
- ○ Bronchitis-chronic
- ○ Cirrhosis-liver
- ○ Colitis-ulcerative
- ○ Depression
- ○ Emphysema
- ○ Fibrocystic breasts
- ○ Obesity-more than 20 lbs. overweight
- ○ Pneumonia
- ○ Polyps in colon
- ○ Stroke
- ○ Suicide attempt
- ○ I have had NONE of the above PROBLEMS listed.

21 GENERAL HEALTH STATUS

RATE YOUR HEALTH generally	Poor		Fair		Good
Physical health	○	○	○	○	○
Emotional health	○	○	○	○	○

22 Do you have any PERMANENT MEDICAL DISABILITIES?
○ Yes ○ No If "yes" specify cause. If "no" go to Unit 23.

- ○ Blindness
- ○ Cancer
- ○ Stroke
- ○ Diabetes
- ○ Deafness
- ○ Effects from injury
- ○ Heart disease
- ○ High blood pressure
- ○ Low back problem
- ○ Lung disease
- ○ Mental illness
- ○ Multiple sclerosis
- ○ Paralysis
- ○ Cerebral palsy
- ○ Other causes

23 FAMILY MEDICAL HISTORY (blood relatives)

Your blood relatives include your children, brothers, sisters, parents, and grandparents.

Mark items that apply to your blood relatives.

- ○ I DO NOT KNOW my family medical history.
- ○ Mother/sister had breast cancer.
- ○ Two or more family members (mother, sisters) had breast cancer.
- ○ Father died of heart attack before age 60.
- ○ Mother died of heart attack before age 60.
- ○ Alcoholism
- ○ Sickle cell anemia
- ○ Bleeding trait
- ○ Cancer
- ○ Diabetes (sugar)
- ○ Heart disease
- ○ High blood pressure
- ○ Mental illness
- ○ Stroke
- ○ Suicide
- ○ Tuberculosis
- ○ Other
- ○ I have NO FAMILY MEMBERS with the above diseases.

SYMPTOMS

Symptoms you have may indicate a problem that requires medical attention. Mark any of the symptoms that you currently have or have had within the past year.

24 HEAD

1 ○ Staggering or balance problems
2 ○ Spinning sensation or dizziness
3 ○ Fainting spells
4 ○ Convulsions or seizures
5 ○ Inability to speak for a few minutes
6 ○ Frequent or severe headaches
7 ○ I have had NONE of the above HEAD or NEUROLOGICAL problems in the past year.

25 EYE, EAR, NOSE AND THROAT

1 ○ Persistent pain in either eye
2 ○ Double vision
3 ○ Unexpected decrease of vision in one eye
4 ○ Persistent or frequent hoarseness
5 ○ I have had NONE of the above EYE, EAR, NOSE or THROAT problems in the past year.

26 HEART AND LUNGS

1 ○ Frequent or persistent wheezing
2 ○ Frequent or persistent cough
3 ○ Frequent or severe shortness of breath
4 ○ Calf pain when walking, relieved by rest
5 ○ Irregular heartbeat, skipped beats
6 ○ Bouts of heartbeat so fast you can't count
7 ○ Pain, pressure or tight feeling in chest which forced you to stop walking
8 ○ Frequent or severe chest pain
9 ○ Shortness of breath lying down, relieved by sitting up
10 ○ I have had NONE of the above HEART OR LUNGS problems in the past year.

27 DIGESTIVE

1 ○ Frequent nausea or vomiting
2 ○ Vomiting of blood
3 ○ Black tarry stools
4 ○ Frequent diarrhea or watery stools
5 ○ Unexplained rectal bleeding
6 ○ Frequent or severe heartburn or indigestion
7 ○ Frequent or severe abdominal pain
8 ○ I have had NONE of the above DIGESTIVE problems in the past year.

28 URINARY

1 ○ Loss of urine control
2 ○ Blood in urine
3 ○ I have had NONE of the above URINARY problems in the past year.

29 MEN ONLY (Women go to unit 30).

1 ○ Nodule in testicle growing larger

30 WOMEN ONLY (Men go to unit 31)

1 ○ I have never had a period.
2 ○ My periods have stopped due to surgery.
3 ○ My periods have stopped due to menopause (change of life).
4 ○ I am currently using birth control pills.
5 ○ I am currently pregnant.

Mark the number of term pregnancies you've had.

6 ○ zero ○ one ○ two ○ three or more

Mark any BREAST or REPRODUCTIVE system problems you have had in the past year.

7 ○ Vaginal bleeding after menopause (change of life)
8 ○ LUMP IN BREAST

If you have a BREAST LUMP, mark details.

9 ○ Growing larger
10 ○ Skin change
11 ○ Present less than a year
12 ○ Doctor has evaluated it.

13 ○ I have had NONE of the above BREAST or REPRODUCTIVE SYSTEM problems in the past year.

31 OTHER BODY SYSTEMS

1 ○ Frequent or constant thirst
2 ○ Weight loss not diet related
3 ○ Skin lesion that won't heal
4 ○ Mole growing rapidly
5 ○ Unexplained fever or chills
6 ○ Skin or whites of eyes turning yellow
7 ○ I have had NONE of the above BODY SYSTEM problems in the past year.

32 Mark areas for which you would like ADDITIONAL INFORMATION if available.

1 ○ Alcohol control	12 ○ Legal problems
2 ○ Birth control	13 ○ Loneliness
3 ○ Blood pressure management	14 ○ Marital problems
4 ○ Cardiac rehabilitation program	15 ○ Medical emergencies
5 ○ Diabetes management	16 ○ Self breast exam
6 ○ Diet/nutrition	17 ○ Sexual problems
7 ○ Drug abuse	18 ○ Smoking cessation
8 ○ Emotional problems	19 ○ Stress management
9 ○ Exercise/fitness	20 ○ Venereal disease
10 ○ Health hazards	21 ○ Weight reduction/control
11 ○ Human sexuality	22 ○ General health information

THANK YOU

For completing this health assessment. Please enclose in the envelope provided and mail to MDI for processing.

This health assessment is not a substitute for routine medical examinations and does not replace traditional medical care administered by medical doctors.

APPENDIX B

COOPER'S FITNESS CATEGORIES

COOPER'S FITNESS CATEGORIES

	AGE		
CATEGORY	13-19	20-29	30-39
Very Poor	< 25.0	< 23.6	< 22.8
Poor	25.0-30.9	23.6-28.9	22.8-26.9
Fair	31.0-34.9	29.0-32.9	27.0-31.4
Good	35.0-38.9	33.0-36.9	31.5-35.6
Excellent	39.0-41.9	37.0-40.9	35.7-40.0
Superior	> 42.0	> 41.0	> 40.1

	AGE		
CATEGORY	40-49	50-59	>60
Very Poor	< 21.0	< 20.2	< 17.5
Poor	21.0-26.4	20.2-22.7	17.5-20.3
Fair	24.5-28.9	22.8-26.9	20.1-24.4
Good	29.0-32.8	27.0-31.4	24.3-30.2
Excellent	32.9-26.9	31.5-35.7	30.3-31.4
Superior	> 37.0	> 35.8	> 31.5

Note: Values are in O2 ml/kg/min and are in female gender.

APPENDIX C

COVARIATE LIPID MEANS

LIPID LEVELS

			TC		HDL-C	
	N	%	MEAN	S.D.	MEAN	S.D.
COVARIATES						
SMOKING:						
1. NEVER	450	58.1	196.7	40.9	53.8	12.7
2. QUIT	188	25.1	202.6	41.3	56.1	13.8
3. CURRENT	126	16.8	208.0	43.1	48.9	11.8
FAMILY HISTORY:						
1. NO	473	60.0	197.7	42.2	53.3	13.3
2. YES	311	40.0	204.0	41.5	53.9	13.2
MENOPAUSE:						
1. PRE	771	98.4	199.9	41.9	53.4	13.2
2. POST	13	1.6	220.5	44.7	61.6	14.5
ORAL CONTRACEPTIVE:						
1. NO	746	94.9	200.6	42.5	53.4	13.3
2. YES	38	5.1	191.9	32.3	56.9	11.4
ALCOHOL CONSUMPTION:						
1. NONE	227	28.9	201.9	44.2	52.3	13.2
2. $\leq$ 2/WK.	448	57.0	200.8	41.4	53.2	12.9
3. $\geq$ 3/WK.	109	14.0	194.4	39.8	57.2	13.2
FAMILY INCOME:						
1. < $10K	24	3.3	194.8	43.0	48.0	10.5
2. $10-20K	182	24.6	203.2	39.0	52.9	13.3
3. $21-40K	306	41.3	199.4	40.6	53.8	12.3
4. > $40K	227	30.8	198.7	45.0	54.5	13.8

APPENDIX D

COVARIATE F-VALUES AND p-VALUES

F-VALUES AND p-VALUES

		F-VALUE	p-VALUE
FITNESS LEVEL:	TC	16.19	.0001
	HDL-C	20.85	.0001
AGE:	TC	35.08	.0001
	HDL-C	15.97	.0001
BODY COMPOSITION:	TC	24.16	.0001
	HDL-C	10.17	.0015
SMOKING STATUS:	TC	3.61	.023
	HDL-C	8.92	.0002
ALCOHOL CONSUMPTION:	TC	.18	.83
	HDL-C	7.89	.0004
MENOPAUSE:	TC	2.86	.09
	HDL-C	6.51	.01
ORAL CONTRACEPTIVES:	TC	.36	.55
	HDL-C	.31	.58
FAMILY HISTORY:	TC	3.32	.07
	HDL-C	.14	.71
FAMILY INCOME:	TC	.61	.61
	HDL-C	1.50	.21
STRESS:	TC	.19	.66
	HDL-C	.39	.53
DIET:	TC	.05	.83
	HDL-C	.01	.92

VITA

Graydon Harris Yohe

Candidate for the Degree of

Master of Science

Thesis: THE RELATIONSHIP BETWEEN SUBMAXIMAL AEROBIC CAPACITY AND BLOOD LIPIDS IN A FEMALE POPULATION

Major Field: Health, Physical Education, and Leisure

Biographical:

Personal Data: Born in Olney, Illinois, July 15, 1968, the son of Richard C. and Gail H. Yohe.

Education: Graduated from Edmond Memorial High School, Edmond, Oklahoma, in May 1986; received Bachelor of Science Degree from Oklahoma State University, Stillwater, Oklahoma, in May 1991; completed the requirements for the Master of Science at Oklahoma State University, Stillwater, Oklahoma, in May 1993.

Professional Experience: Graduate Assistant, Oklahoma State University Wellness Center, from August, 1991, to present. Fitness Instructor, St. Francis Hospital, Tulsa, Oklahoma, from June, 1992, to present.