EFFECTS OF A COMPREHENSIVE WELLNESS PROGRAM ON
SERUM LIPID CONCENTRATIONS AMONG THE RESIDENTS
OF TUSCARAWAS COUNTY, OHIO

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EFFECTS OF A COMPREHENSIVE WELLNESS PROGRAM ON SERUM LIPID CONCENTRATIONS AMONG THE RESIDENTS OF TUSCARAWAS COUNTY, OHIO

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Thesis

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CHAPTER I

INTRODUCTION

A group of disorders of the heart and blood vessels, cardiovascular diseases (CVD) typically comprise the following: coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism (1). Cardiovascular disease generally refers to conditions characterized by narrowed or blocked blood vessels; these can lead to a heart attack, chest pain (angina) or stroke (2). The leading cause of death in the United States (1), causing 40% of all deaths there, cardiovascular disease claims more lives than all forms of cancer (2).

Traits and lifestyle habits that increase the risk of disease are known as risk factors (3). For cardiovascular disease these include age, smoking, physical inactivity, family history, sex, poor diet, high blood pressure, high blood cholesterol levels, obesity, diabetes, high stress, and poor hygiene (2). Although age, family, history, and sex are nonmodifiable risk factors, the remaining risk factors are modifiable and can be reduced or eliminated by addressing lifestyle factors such as poor diet, physical inactivity, smoking, and stress (2,3). One regional area affected by increased risk for CVD is the Appalachian region of southern Ohio, specifically Tuscarawas County (4). “In Tuscarawas County, 29.6% of adult residents currently smoke cigarettes, 31% are
overweight and 32.4% are obese” (4). Each of these behaviors increases the risk of developing cardiovascular disease (3). “Heart disease was the leading cause of death for Tuscarawas County residents in 2004-2006” (4), and “6.8% of residents reported they previously suffered a heart attack, while 7.0% had angina or coronary heart disease during 2004, 2006 and 2007” (4).

Tuscarawas County is considered a Health Professional Shortage Area and lacks affordable fitness and diet programs to address the high prevalence of CVD (Grant Number: D04RH06936). In efforts to increase the overall health and decrease the prevalence of CVD among Tuscarawas County residents, the Fit for Life program was created.

The Fit for Life program is a quarterly 12-week diet and exercise intervention funded by the Department of Health and Human Services (Grant Number: D04RH06936), the purpose of which is to improve the fitness and overall health of community members of all ages; but as a service grant the protocol was not designed as a structured scientific study.

Statement of the Problem

Whether or not the Fit for Life protocol is an effective intervention regarding cardiovascular risk has not been determined. High blood lipid concentrations are a major risk factor for cardiovascular disease (2). In fact, “41.7 percent of Tuscarawas County adult residents had been told by their doctors that their cholesterol was high during 2004, 2006 and 2007” (4). “High blood lipid levels are commonly treated with pharmacological therapies such as 3-hydroxy-3-methylglutaryl CoA reductase inhibitors
(statins), bile acid sequestrants, nicotinic acid, fibric acids, and the cholesterol absorption inhibitor, ezetimibe” (5). Although these drugs are effective in favorably shifting blood lipid concentrations within short periods of time, they pose several safety concerns with long-term use (5). Nonpharmacological approaches, such as lifestyle modification therapy, are a safe avenue to lowering blood lipid levels with no adverse long-term affects (5). Lifestyle modifications are recommended in the Third Report of the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) (5). The lifestyle factors contributing to deleterious blood lipid concentrations should be targeted for modification and include the following: poor diet, physical inactivity, and ineffective stress management (1,3,5).

Purpose of the Study

The purpose of this analysis was to assess the effectiveness of a 12-week intervention addressing the lifestyle factors (poor diet, physical inactivity, and ineffective stress management) that can affect blood lipid profiles, thus reducing risk for cardiovascular disease.

Significance of the Study

If the Fit for Life intervention is successful among adults who practice poor nutrition and are sedentary, overweight and at risk for CVD, it could become an intervention widely used for treatment of similar populations; that is, those who are at risk for cardiovascular disease may receive this type of intervention as opposed to drug therapy.
Hypothesis

Participants in the Fit for Life intervention will improve their blood lipid profile (i.e., reduced low-density lipoprotein, triglycerides, total cholesterol, and increased high density lipoprotein) compared to their baseline (preintervention) lipid profile, thus decreasing their risk for cardiovascular disease.

Summary

Although cardiovascular disease is the major cause of death in the United States, it is partly a preventable disease. “The incubation period for the progression of atherosclerosis to clinical disease is long, which provides an opportunity for risk factor modification.” (6). By addressing modifiable lifestyle factors, such as becoming physically active, altering the diet, and managing stress, people can improve their blood lipid profile, thus lowering cardiovascular disease risks (1,3,5). The comprehensive Fit for Life program may be an effective means toward this end in a specific population.

Definitions

The terminology used in the analysis is defined as follows:

Appalachian Region: “The Appalachian Region, as defined in Appalachian Regional Commission authorizing legislation, is a 205,000-square-mile region that follows the spine of the Appalachian Mountains from southern New York to northern Mississippi. It includes all of West Virginia and parts of 12 other states: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia. Forty-two percent of the Region's population is rural, compared with 20 percent of the national population” (7).
Cholesterol: A fat-like pearly substance, an alcohol, found in all animal fat and oils; a main constituent of some body tissues and body compounds (8).

High density lipoprotein (HDL): a protein lipid complex in the blood that facilitates the transport of triglycerides, cholesterol, and phospholipids (8).

High density lipoprotein cholesterol (HDL-C): one mechanism whereby cholesterol is transported in the blood. High HDL concentrations are somewhat protective against coronary heart disease (8).

Lipids: a class of fats or fat-like substances characterized by their insolubility in water and solubility in fat solvents; triglycerides, fatty acids, phospholipids, and cholesterol are important lipids in the body (8).

Lipoproteins: complexes of lipids and proteins that play a role in the transport and distribution of lipids (9).

Low density lipoprotein (LDL): a protein lipid complex in the blood that facilitates the transport of triglycerides, cholesterol, and phospholipids (8).

Low density lipoprotein (LDL-C) cholesterol: a mechanism whereby cholesterol is transported in the blood. High blood concentrations are associated with increased incidence of coronary heart disease (8).

Total cholesterol: sum of LDL (low density) cholesterol, HDL (high density) cholesterol, VLDL (very low density) cholesterol, and IDL (intermediate density) cholesterol (8).

Triglycerides: one of the many fats formed by the union of glycerol and fatty acids (8).
CHAPTER II
REVIEW OF LITERATURE

The review of literature was conducted using Medline (U.S. National Library of Medicine) as well as various Internet search engines, such as Google Scholar. Journal articles of interest were downloaded directly from the online journal archives or ordered via interlibrary loan. This chapter covers (a) dietary factors that can improve blood lipid concentrations, (b) the role that exercise plays in improving blood lipid concentrations, and (c) the benefits of combined dietary intervention and exercise on improving blood lipid concentrations.

Dietary Modifications

Given the global prevalence of CVD, an increasing need exists for dietary approaches in the management of CVD risk (10). “Despite the proven effectiveness of statin medications, many individuals remain hesitant to use lipid-lowering medications and desire an alternative dietary means to lower serum cholesterol levels” (11). The NCEP has identified LDL, the major atherogenic lipoprotein, as the principal target of cholesterol-lowering therapy (12). Furthermore, researchers have found that the traditional focus of lipid management may have been too simple an approach to lowering cholesterol; instead the inclusion of certain foods or factors over the avoidance of saturated fat and cholesterol in establishing an effective diet are recommended. As
dietary strategies for lipid management are refined, the gap between the effectiveness of dietary approaches and drug therapy may decrease (13).

Several dietary factors or foods have been reported to improve lipid concentrations and include soy protein, plant sterols, soluble fiber, oats, and nuts (13). “Each is derived from plant food sources and the inclusion of these factors, rather than avoidance, that is reported to confer benefits” (13).

Dietary Fiber

Dietary fiber is the indigestible portion of plant foods and has two main components: soluble and insoluble fiber (9). Ingestion of dietary fiber has several health benefits, including delayed emptying of food from the stomach producing a feeling of satiety, regulating blood sugar, preventing constipation, and promoting regularity (9). Dietary fiber can be found in food items such as whole grain products, legumes, fruits, vegetables, and seeds and nuts. “Despite its many health benefits, average fiber intakes for US children and adults are less than half of the recommended levels” (14). High dietary fiber intake is associated with lower serum cholesterol concentrations and significantly lower cardiovascular disease risk as opposed to lower dietary fiber intake (14). A diet high in fiber is recommended for eliminating or reducing CVD risks factors (15).

Two well known forms of soluble fiber – beta glucan and psyllium – have favorable effects on the lipid profile by lowering LDL and total cholesterol concentrations (15-17). Cholesterol reduction occurs as a result of decreased absorption of bile acids. Removal of steroids through fecal excretion as a result of decreased
absorption of bile acids causes increased metabolism of cholesterol, “an increase in the secretion of bile acids, a decrease in lipoprotein cholesterol secretion, and a reduction in the total body pool of cholesterol” (9, 15). Beta glucan is thought to lower cholesterol by “interfering with the absorption of dietary fat and cholesterol as well as enterohepatic recirculation of cholesterol and bile acids” (15). Beta glucan and psylluim are commonly found in oats and ready to eat cereals (15). Because oats and ready-to-eat cereals are inexpensive and found in most grocery stores the opportunity to consume soluble fiber is accessible to the average American. Beta glucan (three grams/day) in ready-to eat-cereal was used by Maki et al. in a group of overweight men and women; the researchers found significant decreases in LDL and total cholesterol concentrations in as early as four weeks in the twelve week intervention in comparison to the control group who received a diet low in fiber (16). Queenen et al. used a concentrated form of beta glucan and also found significant decreases in LDL and total cholesterol concentrations in participants who received six grams of beta glucan/day (15). Kris-Etherton et al. showed decreases in plasma triacylglycerol, LDL, triglyceride, and total cholesterol concentrations compared to baseline concentrations in an intervention group who received six grams of psylluim/day in addition to a low-fat diet (18). In a study exploring the effects of psylluim on lipid concentrations Sola et al. concluded that soluble fiber found in the P. ovata husk has a more favorable effect on lipoprotein profile in comparison to insoluble fiber found in the P. ovata seeds (17).

Therefore, the ingestion of soluble fiber such as beta glucan and psylluim has beneficial effects on the lipid profile through the lowering of serum cholesterol.
concentrations, further decreasing CVD risk and should be consumed as part of a well balanced diet, with a low to moderate-fat intake (15).

Dietary Portfolios

Dietary portfolios include dietary components such as soy protein, plant sterols, almonds, and viscous fiber, that have proven beneficial in lowering LDL concentrations independently but when combined are thought to exert a more beneficial effect on lipid concentrations (13). Jenkins et al. tested this hypothesis and found lower total and LDL cholesterol concentrations among subjects who consumed viscous fiber, plant sterols, almonds, and soy protein in addition to a diet low in saturated fat diet in comparison to a control group consuming a diet low in saturated fat (19). These same subjects were compared to a group consuming a diet low in saturated fat while receiving statin medication. No significant differences arose between the dietary portfolio and statin groups relating to the total and LDL concentrations (19). If researchers can successfully continue to show that dietary portfolios have similar effects on lipid concentrations similar to those of statin medications, then they may prove to be an effective avenue for treating elevated lipid concentrations that is less expensive and without potential side effects.

Gardner et al. also showed the effects of dietary portfolios on reducing total and LDL cholesterol concentrations among moderately hypercholesterolemic men and women who consumed a plant-based low-fat diet (20). The researchers credited higher soy, fiber, plant sterols, and garlic content for the greater effect on the LDL concentrations in the subjects who consumed the plant-based low-fat diet (20).
Dietary Fat

Diets that have lower saturated fat levels have proven to significantly decrease LDL cholesterol concentrations and have been used as a first approach to reducing elevated lipid concentrations (21). Low-fat diets have also shown to decrease HDL cholesterol concentrations, and these reductions have been seen in both men and women (22). Wood et al. found significant decreases in LDL cholesterol concentrations among women consuming a low-fat diet as compared to the control group, but this decrease was not seen among the men receiving the same dietary intervention (23). The same women also showed significant decreases in their HDL cholesterol concentrations whereas the men did not (23). Lefevre et al. found HDL cholesterol reductions in a group of men consuming a diet low in fat in comparison to the average American diet (24). Because of reductions in HDL cholesterol concentrations and thus a less favorable improvement on the lipid profile, researchers have highlighted the benefits of diets that contain a more moderate level of fat (25). Moderate-fat diets have more favorable effects on the lipoprotein profile than low-fat diets because of the preservation of HDL cholesterol concentrations (25). Pelkman et al. found that both low-fat and moderate-fat diets were effective in reducing total and LDL cholesterol concentrations during a weight-loss phase of 6 weeks among overweight men and women (25); however, during the weight maintenance phase HDL decreased, and total cholesterol rebounded to baseline concentrations in the low-fat diet group while HDL concentrations remained constant in the moderate-fat diet group (25). Omega-3 fatty acids should be considered when constructing dietary interventions to improve blood lipid profiles.
Omega-3 fatty acids in the form of fish and walnuts have been shown to decrease total and LDL cholesterol concentrations (26, 27). Research suggests that bioactive molecules in nuts have cardioprotective effects; in addition they are low in saturated fat and high in monounsaturated and polyunsaturated fat (26). Sabate et al. found that men who consumed walnuts three times a day had more favorable (i.e., more reduced total and LDL cholesterol concentrations) effects on the lipid profile than that of the recommended reference diet” (26). This research “suggest that replacing a portion of the fat in a cholesterol-lowering diet with walnuts further lowers serum cholesterol levels by more than 10 percent in normal men” (26). As fish consumption increases, the consumption of meat is thought to decrease, and thus saturated and total fat intakes are decreased indicating the benefits of daily fish consumption (27). Participants in a 16-week diet and weight loss regimen intervention by Mori et al. showed significant increases in HDL2 concentrations and a significant decrease in triacylglycerol concentrations compared to the control group whose members were on a weight maintaining diet regimen (27). The subjects consumed a fish meal (rich in Omega-3 fatty acids) once per day. This study suggests that “the increase in HDL2 could markedly decrease CVD risk since HDL2 is thought to be the subfraction of HDL that’s the most protective against CVD” (27).

**Phytochemicals (Fruits and Vegetables)**

There are likely multiple mechanisms “through which fruits and vegetables protect against cardiovascular disease.” The constituents that are thought to be beneficial in fruits and vegetables include antioxidant vitamins, folate, fiber, and minerals such as potassium (28). The participants in the National Heart, Lung, and Blood Institute Family
Heart Study showed an inverse relationship between fruit and vegetable intake and CVD risk with a mean fruit and vegetable intake of 3.2 ± 1.7 servings/day among men and 3.5 ± 1.8 servings/day among women (29). The results of Bazzano (30) and Liu et al. (31) also confirmed the inverse relationship between fruit and vegetable intake and CVD risk.

Diets rich in fruits and vegetables are high in dietary fiber (14), which is also noted to improve cholesterol concentrations (14). Finding that the lowest risks of CVD were observed in persons with high consumption of green leafy vegetables, cruciferous vegetables, and vitamin C-rich fruit and vegetables, Joshipura et al. identified the importance of continuing to recommend increased overall intake of fruits and vegetables because the apparent beneficial association cannot be attributed to a single constituent of fruits and vegetables (28).

Meal Patterns

Meal patterns, breakfast consumption, and fast-food consumption affect energy and macronutrient intake, which adverse effects on blood lipid concentrations and thus CVD risk (32, 33, 34). The American diet has changed radically over the last few decades in response to both parents working outside of the home and a busier lifestyle (33). With this change in lifestyle, more families consume meals outside of the home, making them “vulnerable to potential weight gain from the excessively large portions commonly served” (33). With busier lifestyles the omission of breakfast is also common and often leads to higher intakes of fat and calories throughout the day. Farshchi et al. examined the effects of breakfast consumption on plasma lipid concentrations in healthy lean women, showing higher levels of total and LDL cholesterol concentrations in
subjects during periods when they omitted breakfast compared to the periods when they ate breakfast (33). This study suggests the “potential importance of breakfast consumption to plasma cholesterol concentrations, which are known risk factors for cardiovascular disease” (33). As the portion sizes of foods served in America increase, consumers have a distorted perception of the correct portion sizes (34). Hannam et al. found that overweight female subjects who were given the correct portion sizes via frozen meals (2 frozen entrées for lunch and dinner) in conjunction with consuming a low-fat diet significantly decreased their total cholesterol concentrations in comparison to the control group that was instructed to self-select their portion sizes and meals based on the food guide pyramid (34.) These results suggest the importance of serving size on energy intake and weight loss, which can decrease total cholesterol and thus CVD risk (34).

Dietary factors play a major role in decreasing LDL and total cholesterol concentrations. Soluble fiber, lowered saturated fat intake, Omega-3 fatty acids, phytochemicals, soy, plant sterols, and garlic have all been shown to have a favorable effect on LDL and total cholesterol concentrations. Current research suggests that the inclusion of all of the above mentioned food components may have greater effects on LDL and total cholesterol concentrations than alone (19, 20). Addressing eating behaviors such as dining out, breakfast consumption, and serving sizes may also serve as an effective avenue for decreasing LDL and total cholesterol concentrations (32, 33, 34). Studies suggest that the inclusion of breakfast and correct portion size have a positive effect on the macronutrient and energy intake which can decrease total cholesterol and CVD risk (33, 34).
Exercise

Physical inactivity is recognized as a risk factor for CVD (8). “Exercise training increases cardiovascular functional capacity and decreases myocardial oxygen demand at any level of physical activity in apparently healthy persons as well as in most patients with cardiovascular disease” (35). “Regular physical activity is required to maintain these training effects” (35). “Among its many benefits, habitual physical activity is thought to reduce cardiovascular disease risk, at least in part, by its favorable influence on circulating blood lipids and lipoproteins” (36). “In general, blood lipid and lipoprotein profiles of physically active groups reflect a reduced risk for the development of cardiovascular disease when compared with their inactive counterparts” (35, 36). Exercise has the greatest effect on HDL and triglyceride concentrations with a smaller affect on LDL (8).

“Although HDL is thought to protect against CVD, the precise means by which it exerts its antiatherogenic effects are still being characterized. . . . It appears that HDL is likely protective through multiple pathways, including both reverse cholesterol transport and non–cholesterol-dependent mechanisms” (37). HDL is believed to play a key role in the process of reverse cholesterol transport (RCT), in which it promotes the efflux of excess cholesterol from peripheral tissues and returns it to the liver for biliary excretion (38).

Endurance exercise has proven to increase HDL levels and decrease triglyceride levels (39,40,41,42). This fact has proven true in many populations, such as premenopausal women (39) postmenopausal women (40), men (41), and sedentary populations (39-44). Halverstadt et al. found that endurance exercise training had
positive effects on lipoprotein variables independent of baseline body fat, diet, and changes in body fat during the training period (43).

Regular long-term exercise in the form of aerobic and resistance training is considered to improve lipid concentrations (39). Studies by Park, as well as Marques et al., found significant decreases in LDL, TC, TG with increases in HDL among middle-aged obese women and elderly women, who participated in combined aerobic and resistance training studies for periods of six to eight months (40, 41, 42). These training effects were not observed when resistance training was done alone (42). In the study with the elderly women “it was thought that the mechanism of increase in HDL-C with exercise was due to the increase of lecithin cholesterol acyltransferase (LCAT) activity and delayed catabolism of HDL and apolipoprotein” (40). In both studies women did aerobic exercise two to three times/week for 40-60 minutes (40, 42).

Lipoprotein Subfractions

“A current theory suggest that the subfractions—small, dense LDL and the variant lipoprotein A—may be prone to oxidation by macrophages at an injured site in the arterial epithelium, leading to an influx into the cell wall and the formation of plaque” (8). Accelerating this process is the presence of oxygen-free radicals (8). The literature also suggests that these lipoprotein subfractions are better indicators of CVD risk and more sensitive to exercise training than the traditional lipid profile and should be considered when evaluating the effectiveness of exercise interventions (43-45). Sittiwicheanwong et al. assessed lipoprotein subfractions for CVD risk among middle-aged sedentary Thai women, who participated in a moderate exercise training program
In 12 weeks of aerobic training, the women significantly reduced their levels of sd-LDL as well as their sd-LDL to large buoyant-LDL (lb-LDL). The reduced ratio of sd-LDL/lb-LDL indicates that the conversion of lb-LDL to more atherogenic sd-LDL was inhibited by moderate exercise training (44).

Fish Oil and Exercise

After supplementing the diets of overweight volunteers with fish oil, Hill et al. concluded that “fish oil supplements and regular exercise both reduce body fat and improve cardiovascular and metabolic health. . . . Increasing intake of Omega-3 fatty acids could be a useful adjunct to exercise programs aimed at improving body composition and decreasing cardiovascular disease risk” (46).

Exercise training has proven benefits on HDL concentrations and some subfractions of LDL thus decreasing CVD risk through blood lipid alterations (39, 42-44). Exercise training has also shown to attenuate the decrease of HDL concentrations caused by dietary interventions that lower saturated fat intake and should be considered for interventions that seek to favorably alter the lipid profile (20).

Diet and Exercise

Greater improvements on blood lipid concentrations occur when dietary intervention and exercise training such as endurance exercise are done simultaneously instead of separately (47). Dietary reduction of saturated fat lowers LDL but also lowers HDL cholesterol concentrations (47). Exercise negates or attenuates the reduction of HDL when done in conjunction with dietary interventions (23, 47). Both men and women who participate in diet and exercise interventions significantly reduced their
estimated risk for coronary heart disease because of these training effects (23, 47, 48, 50). Both overweight and obese populations have also experienced the benefits of these combined interventions (48, 49). The Mediterranean diet in conjunction with exercise produced decreases in LDL, TC, and TG in as little as two months, while producing significant improvements in HDL in four months (48). The National Cholesterol Education Program [NCEP] Step 2 diet in conjunction with exercise significantly reduced total and LDL cholesterol concentrations while having no adverse effects on HDL (49). The Dietary Approaches to Stop Hypertension diet in conjunction with moderately intense aerobic exercise also produced decreases in LDL and TC concentrations (50). The decreases in HDL concentrations observed when dietary interventions were done alone suggests that the addition of exercise negates the decrease or increases in HDL concentrations (48, 49).

The benefits of diet and exercise alone have beneficial effects on lipid concentrations; however, the combined benefits outweigh the benefits provided separately and should be used for maximum effects on altering blood lipid concentrations and CVD (23, 47-50).

Weight Reduction

The literature suggests that weight loss may be a crucial factor in increasing HDL concentrations observed with exercise further improving the lipid profile (49, 51). Layman as well as Nicklas et al. have shown favorable improvements in blood lipid concentrations (i.e., reduced TG, TC, and LDL) with weight loss as a result of decreased dietary fat intake and increased physical activity (52-54). Dattilo et al. found that HDL
concentrations significantly decreased during the weight reduction period of interventions but significantly increased when subjects were at a stabilized, reduced weight (51-53). Hannum et al. observed significant reductions in weight and TG among participants who consumed a diet using portion-controlled entrees as compared with the group who self-selected their meals and portion sizes (34). This study indicates that “consumption of a diet using portion-controlled entrees enhances weight loss success” and further improves the blood lipid profile (34).

Comprehensive Programs

A comprehensive approach to changing behavior is used in many different fields, including psychology, mental health, medicine, and public health. The comprehensive approach, which utilizes the expertise of professionals in many fields, has become more common in nutrition and exercise programs designed to decrease disease states through lifestyle modification. Programs traditionally focusing on reducing excess weight through caloric restriction now include aspects other than food intake that can contribute to successful weight loss. Practitioners and researchers have thus sought the expertise of psychologists and exercise physiologists, who can assist participants in exploring the emotional and environmental aspects contributing to or hindering positive eating and exercise behaviors. Factors that have contributed to the success of participants in comprehensive programs include self-monitoring practices, family and peer support and participation, feedback and encouragement from program staff, affirmation of progress, and most importantly a sense of self-efficacy (55,56).
Self-Monitoring

An analysis by Gleeson-Kreig et al. revealed that the practice of keeping activity records enhanced feelings of self-efficacy, suggesting that such a practice should be encouraged as a tool to increase self-efficacy and the potential for long-term changes in behavior. They also noted that health care professionals must attend to the effort the participant has made by providing verbal praise for adherence and offer suggestions for improvements (55, 56). Tate et al. used self-monitoring diaries that included caloric intake and energy expenditure, which were correlated with weight-loss success (56). The participants also received from the therapist recommendations and strategies for improvement on some of the behaviors with which they struggled (56). Tate et al. also found that participants who received consistent feedback from program counselors lost twice as much weight as participants who received information on proper eating and activity habits (56, 57). Evaluation of eating and activity records can improve participants’ success in the program (55).

Educational Approach

The educational approach used by exercise physiologists in comprehensive programs that explain the importance of physical activity is important in patients’ compliance with exercise components (55). One of the participants in the study by Gleeson-Kreig et al. made only minor exercise changes after being told to make changes but not receiving any specifics or recommendations about exercise from his physician (55). Goal setting may also be a behavior that could enhance eating and exercise behaviors. Dinnie et al. found that adherence to physical activity was enhanced by goal
setting. Goals should be divided into manageable parts that do not overwhelm participants and allow short-term success to be evaluated (58). Environmental and personal factors that influence adherence to physical activity must also be investigated to determine success in the exercise portion of comprehensive programs (58).

Additional factors that may determine success in programs and improve weight loss and lifestyle changes include analysis of participants’ motivation, attendance, and commitment (59). Melin et al. found that measuring the metabolic and anthropometrical status during the treatment and providing participants with continuous feedback seemed to be important motivational factors; they also found that high attendance defined as attending 2/3 of the program correlated with greater reductions in weight at 12 and 24 months (59). Decreased commitment was negatively associated with program completion and weight loss in the study by Martin et al. and suggested that expectations of the level of commitment needed to be successful in a program should be thoroughly discussed with participants before the program starts (60). As participants’ self-efficacy increases, they increase their understanding of the factors that affect the what, when, and how they eat and exercise. Participants can begin to make plans to avoid or handle high-risk situations by changing the behaviors that may lead to negative eating and exercise habits. The comprehensive team can assist participants with strategies to make the new habits permanent (59).

In conclusion, high blood lipid concentrations continue to increase individuals’ risk for CVD (4, 5). Modification of several lifestyle factors specifically diet, exercise, and subsequently weight reduction must be addressed to favorably alter blood lipid concentrations and cardiovascular disease risk (13-54). In addition to decreasing the
amount of saturated fat in the diet additional food components, such as soluble fiber, soy, plant sterols, Omega-3 fatty acids, and phytochemicals, should be considered for maximum reductions in TC, TG and LDL concentrations (15, 20, 24, 28). Exercise has many benefits, including its attenuation of the decrease in HDL seen in dietary interventions (39, 42, 44, 46). Alterations in lipid concentrations are observed when diet and exercise interventions are done alone; however, an increased benefit occurs when diet and exercise interventions are done simultaneously, furthering the decrease in the risk for cardiovascular disease (47-50). This review of literature failed to find programs similar to the Fit for Life program that were holistic in their approach to altering blood lipid concentrations; however, some programs of a comprehensive nature were identified and highlighted several factors that can contribute to or hinder the success of participants in comprehensive weight-loss programs.
CHAPTER III
RESEARCH DESIGN AND METHODS

The Fit for Life program is one of the programs offered under Twin City Hospital’s Healthy Community/Healthy Children Outreach Program (HC/HCOP). The HC/HCOP is supported by Health Resources and Services Administration, a rural health services outreach grant. The purpose of the Fit for Life program was to provide free to low-cost fitness and nutrition programming for the residents of Tuscarawas and surrounding counties to decrease the prevalence of obesity in this population. The Fit for Life program is a 12-week program that provides diet and fitness instruction by the program director, who is a Board-Certified Family Practitioner along with a Physical Therapist, Exercise Physiologist and a Registered Dietitian. Class instruction includes information on how to eat and exercise properly as well as addresses “mind wellness” issues by covering the reasons for emotional eating and how to overcome the stress that leads to emotional eating.

The analysis of The Fit for Life Program was approved by the University of Akron Institutional Review Board. Because the data from this program was used in a secondary analysis, they were exempt from a full board review.
Population

A total of 255 adult men and women age 18 and over participated in the Fit for Life program from 2006 to 2008 in 10- to 12-week intervals: Session 1 (30 participants), Session 4 (92 participants), and Session 6 (133 participants). Participants included 74% women and 26% men, 98% of whom were Caucasians, with 85% in the 18-64 age range and the remaining 15% in the 65-and-up age category. Participants reported annual household incomes of more than $31,000. High cholesterol concentrations were reported among 40% of the participants. Participants were recruited from Tuscarawas County, Ohio, and the surrounding counties of Carroll, Harrison, and Guernsey through flyers posted throughout the county, advertisements in a local newspaper, word of mouth from prior Fit for Life participants and the leading agency, Twin City Hospital. Participants throughout the county were eligible to participate in the Fit for Life program; no exclusion criteria barred anyone. Of the 255 participants 121 did not report to the lab to receive their final blood lipid measurements. Hence, the analysis included only the 134 subjects who participated in the 10-12 weeks of dietary and exercise instruction and received pre and post program blood lipid measurements during Session 1 (Fall 2006), Session 4 (Fall 2007), Session 6 (Fall 2008).

Class Instruction

During the 10-12 week program sessions, class instruction consisted of one class per week, one hour per class for a total of 10-12 hours. The Fit for Life classes were conducted at Twin City Hospital for the first session but at a local church for the rest of the sessions (Sessions 2-8) to make the program less intimidating than attending in a
hospital setting. Babysitting was offered to enable parents to participate in the Fit for Life classes. Each Fit for Life class included a weekly nutrition, fitness, and wellness focus/goal (see Appendix A), employed various hands-on activities, a question-and-answer period, a sharing period, PowerPoint presentation and visual aids.

Testing Instruments

Fit for Life participants had the following relevant measurements taken by the program staff during week 1 and weeks 10-12 (Twin City Hospital Laboratory, Dennison, Ohio).

- Weight: Taken on a calibrated balance scale
- Height: Taken on a stadiometer
- Body mass index (BMI): Calculated, weight in kilograms/height in meters squared
- Total cholesterol: Obtained from a 5 milliliter blood sample taken from the arm after fasting for 12 hours. After centrifugation, serum was the blood fraction used for TC analysis. Standard precautions were used for specimen collection and waste was placed in a biohazard bag. Normal Values: 140-199 mg/dl (61).
- Triglycerides: Obtained from a 5 milliliter blood sample taken from the arm after fasting for 12 hours. After centrifugation, serum was the blood fraction used for TG analysis. Standard precautions were used for specimen collection and waste was placed in a biohazard bag. Normal Values: < 150 mg/dl (61).
• HDL: Obtained from a 5 milliliter blood sample taken from the arm after fasting for 12 hours. HDL was precipitated out from the total serum cholesterol for analysis. Normal Values: Men: 35-65 mg/dl, Women: 35-80 mg/dl (61).

• LDL: Also obtained as above and calculated by using the Friedwald formula. Normal Values:<130 mg/dl (61).

Statistical Analysis
A dependent $t$-test was used to compare all blood lipid measures. Data analysis was done using, Statistica Stat Soft Inc (Tulsa, OK). A significance level of $p<0.05$ was set.

Limitations
• The Fit for Life program was created out of a need to provide the community with free to low cost nutrition and exercise programming for the counties of interest. The original program was not part of a research protocol and did not include a control group to compare the results seen in the participants of the Fit for Life program.

• Because of the absence of a control group, we cannot declare a cause and effect relationship between the intervention and alterations in the blood lipid profile.
• No clear-cut diet or exercise regimen was given; thus exactly what factors contributed to the alterations in blood lipid concentrations cannot be determined.

• No specific compliance measures for dietary intake or exercise were taken; therefore, what specific food components or combinations or which exercise amount, duration, or intensity contributed to the alterations of blood lipid concentrations is uncertain.

In conclusion, The Fit for Life program is an educational intervention that addresses life style factors: diet, exercise, and mind wellness. This program may serve as an important educational intervention to favorably alter lifestyle factors that can improve blood lipid concentrations among the residents of Tuscarawas and surrounding counties, thereby decreasing the incidence of CVD among this population.
CHAPTER IV
RESULTS

To assess the effectiveness of the Fit for Life program in altering blood lipid concentrations, the following measurements were taken and analyzed by the Twin City Hospital Laboratory, Dennison, Ohio: total cholesterol, LDL, HDL, and triglycerides. The fall sessions (sessions 1, 4, and 6) were chosen and analyzed as opposed to spring sessions in an effort to rule out seasonal increases in healthier behaviors (e.g., increased physical activity, less holiday snacking) that are likely to occur during spring sessions of similar durations. Each individual session included pre and post measurements for total cholesterol, LDL, HDL and triglycerides (triacylglycerol). From the existing data set, a total of 134 participants completed pre program (week 0) and post program (week 10 for session 1, and week 12 for sessions 4 and 6) blood lipid measurements. The age range of the participants was 18-64 years. These data are presented separately because the individual sessions differed in protocol and duration (i.e., number of weeks).

Total cholesterol was measured during the first week (week 0) of the program and at the end of the program (week 10 in Session 1 and week 12 in Sessions 4 and 6). The mean baseline total cholesterol for session one (Figure 4.1) was 189.1mg/dl, and the mean post intervention total cholesterol for session one was 178.4 mg/dl, showing a
significant decrease in total cholesterol concentrations ($p<0.05$). Figure 4.2 revealed a significant decrease in the LDL parameter for session one with the mean LDL cholesterol before the program at 118.9mg/dl and the LDL cholesterol after the program at 109.7 mg/dl ($p<0.05$). In Figure 4.3 a slight quantitative decrease in HDL cholesterol was observed. This decrease in HDL was nonsignificant. The preprogram population mean for HDL cholesterol was 47.8mg/dl, and the postprogram population mean for HDL cholesterol was 46.4 mg/dl. The pre and post values for the TAG (triacylglycerol) measurement in session one seen in Figure 4.4 revealed no change with both pre and post measurements having a mean of 111mg/dl.

![Fit for Life Total Cholesterol Changes, Session 1](image)

Figure 4.1. Fit for Life total cholesterol changes, session 1.
Figure 4.2. Fit for Life LDL changes, session 1.

Figure 4.3. Fit for life HDL changes, session 1.
Unlike session one the total cholesterol measure in session four (Figure 4.5) showed a nonsignificant decrease in total cholesterol between the pre program (187.3mg/dl) and post program (184.1 mg/dl) measurements (see Figure 4.5). In Figure 4.6 LDL cholesterol was measured at week 0 and week 12 and unlike session one revealed a slight but nonsignificant increase in LDL cholesterol at 112.2mg/dl (Week 0) and 114.3 mg/dl (Week 12). Similar to the HDL measurements in session one the HDL cholesterol measurements for session four revealed a nonsignificant decrease in HDL cholesterol at 47 mg/dl (pre) and 46.7 mg/dl (post) (see Figure 4.7). Unlike the TAG (triacylglycerol) changes observed in session one the TAG changes in session four revealed a 29 mg/dl mean difference (preprogram measurement 144 mg/dl vs.

Figure 4.4. Fit for Life TAG changes, session 1.

Unlike session one the total cholesterol measure in session four (Figure 4.5) showed a nonsignificant decrease in total cholesterol between the pre program (187.3mg/dl) and post program (184.1 mg/dl) measurements (see Figure 4.5). In Figure 4.6 LDL cholesterol was measured at week 0 and week 12 and unlike session one revealed a slight but nonsignificant increase in LDL cholesterol at 112.2mg/dl (Week 0) and 114.3 mg/dl (Week 12). Similar to the HDL measurements in session one the HDL cholesterol measurements for session four revealed a nonsignificant decrease in HDL cholesterol at 47 mg/dl (pre) and 46.7 mg/dl (post) (see Figure 4.7). Unlike the TAG (triacylglycerol) changes observed in session one the TAG changes in session four revealed a 29 mg/dl mean difference (preprogram measurement 144 mg/dl vs.
postprogram measurement 114.9 mg/dl) among participants in their TAG measurements, a significant decrease in TAG cholesterol (p<0.05) (see Figure 4.8).

Figure 4.5. Fit for Life total cholesterol changes, session 4.
Figure 4.6. Fit for Life LDL changes, session 4.

Figure 4.7. Fit for Life HDL changes, session 4.
The total cholesterol changes seen in Figure 4.9 revealed a significant decrease in total cholesterol (p<0.05) similar to session one. The mean total cholesterol at week 0 was 193.3 mg/dl, and the mean total cholesterol at week 12 was 185.1 mg/dl. Figure 4.10 shows a nonsignificant decrease in LDL cholesterol (no reproducible change) with the mean LDL cholesterol of 172.1 mg/dl at week 0 and a mean LDL cholesterol of 114.8 mg/dl at week 12. Similar to the HDL measurements in Figure 4.3, the HDL cholesterol measurements in Figure 4.11 (Session 6) revealed a nonsignificant decrease (no change) in HDL cholesterol at 47.2 mg/dl (pre) and 46.4 mg/dl (post). Similar to the mean difference in TAG cholesterol seen in Figure 4.8, Figure 4.12 revealed a mean difference of 24 mg/dl, resulting in a significant decrease in TAG cholesterol (p<0.05).
Figure 4.9. Fit for Life total cholesterol changes, session 6.
Figure 4.10. Fit for Life LDL changes, session 6.

Figure 4.11. Fit for Life HDL changes, session 6.
The Fit for Life program produced significant decreases in five of the twelve variables measured. Although the reductions in total cholesterol and triglycerides found in two of the three sessions support my hypothesis, the nonsignificant changes observed across sessions among LDL and HDL variables do not. Significant decreases in total cholesterol occurred in Sessions one and six, LDL in Session one, and in triglycerides [TAG] in Session four and six. A slight but nonsignificant quantitative increase in LDL occurred in session four but was not statistically significant. A consistent 1 mg/dl decrease in HDL cholesterol occurred in all three sessions, an observation also
statistically nonsignificant. The pre and post concentrations observed are within the normal range as classified by Fischbach for all four lipid variables (61); however, when compared to the National Cholesterol Education Program’s [NCEP] Adult Treatment Panel III [ATP] classifications, three variables fall within their normal range classification, and one variable falls within their near optimal/above optimal classification (62). Total cholesterol concentrations are within the normal range of 140-199 mg/dl classified by Fischbach and are within the desirable range of <200 mg/dl classified by the [ATP III] (61-62). The pre and post concentrations for the LDL variable are within the normal range of <130 mg/dl classified by Fischbach for all three sessions (61). When compared to the ATP III classification for LDL concentrations, the same pre and post measurements fall within the near optimal/above optimal range (100-129 mg/dl) where optimal concentrations are classified as <100 mg/dl (62). If baseline LDL cholesterol concentrations are 100-129 mg/dl, one of the therapeutic approaches suggested by the ATPIII panel is to initiate or intensify lifestyle and/or drug therapies specifically to lower LDL (62). Both pre and post HDL measurements taken in all three sessions fall within the normal range of 35-60 mg/dl for women and 35-80 mg/dl for men (61). These same measurements fall between the two classifications specified by [ATP III]: low defined as <40 mg/dl and high: defined as ≥ 60 mg/dl at 46-47 mg/dl (62). The classification for normal triglycerides is <150 mg/dl for both Fischbach and the [ATP III] panel (61-62). The measurements taken in all three sessions for the triglyceride variable are within the normal range (61-62). The mean pre program triglyceride concentrations in Session four and six (at 144 and 145 mg/dl) are close to 150 mg/dl, where 150-199 mg/dl is classified as borderline high but dropped significantly to post program
concentrations of (114 and 121 mg/dl) (62). The pre and post triglyceride concentrations are 111 mg/dl, much lower than both Session four and six. The significant decrease observed in two of the three sessions among total cholesterol (Session 1 and 6) and triglyceride (Sessions 4 and 6) concentrations suggest that these variables may be more susceptible to changes in diet and exercise. Overall, serum lipids did not consistently change in a predictable manner from session to session.
CHAPTER V
DISCUSSION

Statement of Problem

Lack of healthy eating and exercise habits coupled with ineffective ways to manage stress increase blood lipid concentrations, increasing cardiovascular disease risk. Intervention programs that address all three lifestyle factors may prove to be an effective avenue to improving serum lipid profiles. Thus, the purpose of this analysis was to examine the pre and post lipid measurements of the Fit for Life program participants to determine the effectiveness of the program in altering blood lipid concentrations.

Summary of Hypothesis

The hypothesis of this analysis was that the participants in the Fit for Life intervention would improve their blood lipid profile (i.e., reduced low-density lipoprotein, triglycerides, total cholesterol, and increased high density lipoprotein) compared to their baseline (preintervention) lipid profile, thus decreasing their risk for cardiovascular disease. The hypothesized reductions in total cholesterol and triglycerides found in two of the three sessions were supported by the data; however, these reductions were not observed consistently from session to session. The hypothesized reductions in LDL and increases in HDL variables were not supported across sessions by the data.
These results indicate that the Fit for Life program was not universally effective in altering all aspects of the blood lipid profile.

Implications

Significant reductions in total cholesterol were observed in two of the three sessions. These reductions are similar to what Stefanick and Miller et al. found in their diet and exercise interventions (49-50). Significant decreases occurred in TAG (triacylglycerol) measurements during Sessions four and six. These results with the exception of increases in HDL are similar to what Marques and Park et al. found among participants partaking in aerobics alone or aerobics plus resistance training (41-42). Slight, but nonsignificant decreases in HDL cholesterol were observed in all three sessions. This decrease in HDL is thought to happen during the weight loss phase of an intervention and to increase once a person is at a reduced stabilized weight (51); however, the literature suggested that the exercise component attenuated the further decrease of the HDL parameter (47). A significant decrease in LDL was seen in session one only. This result differs from what other researchers have found either with dietary interventions alone or with dietary and exercise combined (22, 23, 47, 49). Perhaps looking at lipoprotein subfractions, which are more sensitive to exercise training, may have revealed some alterations in the small dense LDL (sd-LDL) more than total LDL alone (44).

The program’s comprehensive and educational approach may have contributed to participants’ success in changing eating and exercise behaviors. This approach included factors such as peer support and participation, feedback and encouragement from
program staff, affirmation of progress, and goal setting, all of which facilitate positive changes in eating and exercise behaviors (55-58). Assessment tools used to evaluate participants’ readiness or commitment to change were not used in the Fit for Life protocol and may account for the decrease in the number of participants who received their initial blood work but not their final blood work (59). Martin et al. found that decreased commitment was negatively associated with program completion and weight loss and suggested that expectations of the level of commitment needed to be successful in a program should be thoroughly discussed with participants before the start of the program (60). Future analysis of the Fit for Life program’s attendance records may also suggest participants’ level of commitment. Melin et al. found a positive correlation between increased attendance and weight reduction (59); future researchers of the Fit for Life program should determine whether or not a similar correlation can be found between the Fit for Life participants’ weight and attendance.

The Fit for Life program provided specific exercise goals, such as walk 15 minutes/day. This is an important factor because most physicians suggest that patients exercise more without any guidance or suggestions on how to meet such a goal. Often patients who do not partake in any exercise regime as part of their normal routine make only minor exercise changes for lack of education on how to incorporate such changes in their lives (55). Educational approaches that explain the importance of physical activity and give participants suggestions are vital to participants’ compliance with exercise components (55). The inclusion of progressive goals included in the Fit for Life program may have also contributed to participants’ success. During week one the goal for exercise was to walk 15 minutes/day and progress to walking 45 minutes/day by week
12. Introducing new behaviors such as physical activity to otherwise sedentary people can be overwhelming if they are initially expected to perform at the level of a physically fit person and may cause them quickly to abandon the behavior and decrease their level of self-efficacy (55). The Fit for Life program did not use self-monitoring tools, such as diet and exercise logs, which would have been helpful in determining which food components contributed to the alterations in the blood lipid profile. The practice of using diet and exercise logs along with their evaluation has shown to increase a participant’s self-efficacy and success in weight-reduction programs (56-57). In an intervention Tate et al. suggested that participants in the behavior therapy group became more accurate in their estimation of dietary intake and exercise because they were self-monitoring intake and activity; hence, there was a greater association between behavior changes and weight change in this group (56). The addition of these components to the Fit for Life programs protocol should be considered.

Possibilities for Future Research

The literature review identified comprehensive weight-loss programs that used educational approaches to address the effects of diet, exercise, and mind wellness on weight-loss measures (56-57); however, these programs did not assess the programs’ effectiveness in altering blood lipid concentrations, such as the Fit for Life program. This suggests that more programs and further research into them are necessary.

The data from the Fit for Life program included ranges for demographic information such as age and income. Moving forward participant profiles should be created for each participant including demographic information (e.g., age, race, income),
and medical information that includes for example, medical diagnoses, and current medications. This information will allow for the calculation of median numbers for age, weight, and income for the group. Furthermore, the creation and validation of a questionnaire can evaluate aspects of the program that participants felt contributed to their success. This questionnaire could also include questions that could assess participants’ compliance (i.e., did participants’ actually change the behaviors that were suggested such as walking 15 minutes/day, and eat breakfast every day), compliance which could also be assessed by using diet and exercise logs.

Accessing the role that gender plays on altering blood lipid concentrations should be included in future analysis of the Fit for Life program; researchers should study male vs. female differences in blood lipid changes. A difference in the reduction of the LDL variable between men and women in the control group was found by Stefanik et al. (49). Age should also be assessed for the role it could play on the alteration of blood lipid concentrations. In addition to assessing the changes seen in the age range of 18-64, perhaps assessing two to three age ranges, such as 18-33, 33-48, and 48-64, may reveal differences that can be attributed only to age.

The inclusion of a control group and controlling for extraneous variables, such as medications, disease states, use of hormone replacement therapy, supplement and/or substance usage (i.e., cigarettes or alcohol) should be added to ensure that observed changes can be attributed to the program and not other factors. Although significant changes in blood lipid concentrations were observed, they cannot absolutely be attributed to the program without a control group. Future researchers could also look at the effects of the Fit for Life program on other dependent variables, such as weight, blood pressure,
body mass index, and insulin resistance. The program may show significant improvements in these variables, which could also reduce cardiovascular disease risk.

Even though the blood lipid measurements were not consistent throughout all sessions, some significant reductions were observed through this educational program. This is an important finding because it may suggest that education empowers people to make the diet and exercise improvements that work with their lives as opposed to following a specific diet and exercise regimen.

Programs such as the Fit for Life program have the potential to assist adult populations in favorably changing their diet and exercise behaviors, which can in turn decrease their risk for CVD. In conclusion, collective behaviors, such as eating breakfast, consuming correctly sized portion, and increasing fruit and vegetable intake as well as increased aerobics, resistance, and flexibility training, appear to have contributed to alterations in blood lipid concentrations among the Fit for Life participants. Perhaps controlling for extraneous variables along with the addition of a control group assessment tools, and self-monitoring logs can enhance the results seen in the Fit for Life protocol. The Fit for Life program was not effective in altering all aspects of the blood lipid profile but was successful in altering some aspects of the lipid profile, which indicates a lower risk of cardiovascular disease.
REFERENCES


**APPENDIX**

**FIT FOR LIFE ASSIGNMENT OUTLINE**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Nutrition</th>
<th>Fitness</th>
<th>Wellness</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>The Wellness Crisis</em></td>
<td>No change (optional)</td>
<td>Walk 15 min/day (optional)</td>
<td>Read <em>Roadmap to Success</em> (pg 1-47)</td>
</tr>
<tr>
<td><em>The Wellness Choice</em></td>
<td>No “eating out”</td>
<td>Walk 15 min/day x 3 days</td>
<td>Complete Self-evaluation (pg 49-52)</td>
</tr>
<tr>
<td></td>
<td>Drink water 12 oz. x 6/day</td>
<td></td>
<td>Complete Vision Statement (pg 53-55)</td>
</tr>
<tr>
<td></td>
<td>Complete 24 hour fast</td>
<td></td>
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<tr>
<td><em>Stress Management</em></td>
<td>Eat breakfast every day</td>
<td>Walk 15 min/day x 5 days</td>
<td>Set Personal Goals <em>Goal Setting Worksheet</em> (pg 56-76)</td>
</tr>
<tr>
<td></td>
<td>Don’t eat 3 hours before bed</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Eat 6 fruits/vegetables daily</td>
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<tr>
<td><em>Nutrition &amp; Your Health</em></td>
<td>Eliminate “enriched” flour</td>
<td>Walk 30 min/day x 5 days</td>
<td><em>Daily Planning Worksheet</em> (pg 91–)</td>
</tr>
<tr>
<td></td>
<td>Eliminate HFCS</td>
<td></td>
<td>Meet with your “Coach” (pg 77-79)</td>
</tr>
<tr>
<td></td>
<td>Eliminate “hydrogenated” fats</td>
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<tr>
<td><em>Nutrition for Life</em></td>
<td>Eat from small plates/bowls</td>
<td>Walk 30 min/day x 5 days</td>
<td><em>Complete My Inspirational Notebook</em> (pg 82-84)</td>
</tr>
<tr>
<td></td>
<td>Eat by “serving size”</td>
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<tr>
<td><em>Eat to Live</em></td>
<td>Read food labels before eating</td>
<td>Walk 45 min/day x 5 days</td>
<td><em>Focus on the Might</em></td>
</tr>
<tr>
<td><em>Food Labels</em></td>
<td>Eat 3 meals + 2 snacks daily</td>
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<tr>
<td></td>
<td>↓ beef &amp; ↑ fish/poultry</td>
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<tr>
<td></td>
<td>Eat nuts/seeds daily</td>
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<tr>
<td></td>
<td>Cardio 45 min /day x 5 days</td>
<td></td>
<td><em>Focus on the Mind</em></td>
</tr>
</tbody>
</table>

52
| Flexibility Fitness | Stop all “diet” drinks  
Reduce alcohol/tobacco use | Begin Stretching 10 min/day | Focus on the Heart |
|---------------------|----------------------------|-----------------------------|-------------------|
| Cardiovascular Fitness | Reduce caffeine intake  
Prepare meals in advance | Begin Strength Fitness  
3x/wk  
Continue Cardio 5 days  
Continue Flexibility 5 days | Focus on the Spirit |
| Strength Fitness | Complete 24-hour fast | Continue Cardio 5 days  
Continue Flexibility 5 days  
Continue Strength 3 days | Evaluate & Revise goals based on updated self-eval & vision statements |
| Disease Prevention & Healthy Aging | Teach a friend about wellness | Continue Cardio 5 days  
Continue Flexibility 5 days  
Continue Strength 3 days | Develop a “holiday” plan |
| Conclusion | NUTRITION FOR LIFE | FITNESS FOR LIFE | WELLNESS FOR LIFE |