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I, Brian M Farrell,
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Body Composition Changes and Work-Efficiency Effects from Diet Modification and Incorporation of an At-Home Exercise Regimen

Student Signature: Brian M Farrell

This work and its defense approved by:

Committee Chair: Shanil Juma, PhD

Shanil Juma, PhD
Body Composition Changes and Work-Efficiency Effects from Diet Modification and Incorporation of an At-Home Exercise Regimen

By

Brian M. Farrell

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Master of Science, Nutrition Science,
in the Department of Nutrition Science
of the College of Allied Health Sciences (CAHS)
at the University of Cincinnati, Ohio

Committee Chair: Dr. Shanil Juma
ABSTRACT

Body Composition Changes and Work-Efficiency Effects from Diet Modification and Incorporation of an At-Home Exercise Regimen

By: Brian M. Farrell

**Background:** Obesity has been identified as one of the more serious health risk factors facing many individuals and society as a whole. The cost that is associated with the loss of life and medical expenses is significantly greater than that of smoking, excessive drinking, and poverty. In a working population, to stay economically viable and healthy, exercise and physical activity need to be a part of daily lifestyle to maintain both healthy body weight and composition and to prevent negative work effects. Obesity leads to reduced productivity and efficiency at the workplace, and leads to greater healthcare costs for companies. The cost of obesity in healthcare encompasses direct costs such as missed days to indirect costs from increased doctor visits and medications for health complications from obesity. There are numerous studies that support the fact that a modest reduction in weight can improve risk factors of obesity.

**Methods:** A Physical Activity Pamphlet (PAP) was developed to assist employees in service industries with Body Mass Index (BMI) greater than 25kg/m² to make healthier choices about their weekly exercise patterns. The guide centers around adding more steps, burning more calories, and incorporating more exercise in simple ways. There is also a reference to MyPyramid.gov for nutritional advice and dietary suggestions. A Physical Activity Assessment Tool (PAAT) was also developed to measure the impact the PAP could have on changing the behavior of the employee group in making healthier choices.

**Conclusion:** Studies of wellness programs in work settings have shown results of improving healthy behaviors of those that participate in the program. Wellness programs offer nutrition interventions and exercise advice, which include a variety of education tools to improve participant knowledge so they can make healthier choices. Implementing these changes would benefit both employees and their employers. It would aid employees by increasing job satisfaction, efficiency, and motivation, and reducing absenteeism rates. It would benefit employers by decreasing absenteeism, improving efficiency of work force, and improved overall morale at the workplace. This study would have shown that a change in diet and implementing a physical activity regimen would help to reduce weight and favorably change body composition, which would lower risks for chronic diseases and costs associated with obesity.
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INTRODUCTION

Background

Today there are over one billion overweight adults, in which 300 million are obese. Currently, thirty percent of the population is considered obese and almost two-thirds are classified as overweight. Being obese or overweight increases the risk of chronic diseases, including Type-2 diabetes, cardiovascular disease, hypertension and stroke, and certain types of cancer. These health consequences increase the risk of premature death and reduce the overall quality of life. In addition, obesity is affecting our children with more than fifteen percent of the population under eighteen years-old classified as overweight. (1) This rise in obesity is believed to be a result of diets with a higher percentage of fat, saturated fat, and sugar.

Approximately 127 million adults in the U.S. are overweight, sixty million are obese (BMI greater than 30 kg/m²), and nine million are extremely obese (BMI greater than 40 kg/m²) (2). Being overweight or obese not only impacts lifestyle, but it can also lead to lower self-esteem, cause depression and discomfort in social situations (3), and may significantly reduce the quality of life among adults and children.

The cost associated with decreased productivity is estimated at over four billion dollars. The NIDDK data from 1995 estimates the direct cost of obesity in America as $99.2 billion annually, which is over ten percent of the healthcare expenditure for the United States. This is estimating a direct cost of $51.6 billion (5.7% of U.S. healthcare cost). It has only gotten worse in the last decade with the increased rates of obesity. In 2004, the U.S. Centers for Disease Control and Prevention (CDC) ranked obesity as the
number one health threat facing America. Obesity currently results in an estimated 400,000 deaths annually (4) and costs the nation nearly $122.9 billion (5).

Furthermore, there is a shift toward less physically demanding work and more passive leisure time. The most important factor for weight gain in most individuals is the long-term imbalance between energy intake and energy expenditure of physical activity. Some research suggests that the increased incidence of overweight children and adolescents stems from a number of factors including: lack of physical activity, sedentary behavior, familial obesity, socioeconomic status, eating habits, environmental factors and underlying genetic, hormonal, and metabolic conditions. (6) Over the past twenty years, the proportion of overweight children ages six through eleven has more than doubled and the rate for adolescents, ages twelve through nineteen, has tripled. Nearly two-thirds of adult Americans are currently overweight or obese. Despite the attention of the health profession, the media, the American public and mass educational campaigns about the benefits of healthier diets and increased physical activity, the prevalence of obesity in the United States has more than doubled over the past four decades. (7)

The amount of physical activity an individual gets plays an important role in the prevention of overweight/obesity and maintaining weight loss. Overweight and obese individuals are typically classified using body mass index (BMI), defined as their weight in kilograms divided by the square of their height in meters (kg/m²). Clinically, a BMI of over 25kg/m² is defined as overweight, and a BMI of over 30kg/m² is obese. Reduction in BMI has been shown to reduce the potential development of several chronic diseases and improves health outcomes. (8)
It may be shown that different diets combined with exercise will help different people lower BMI or reduce their weight. Experts recommend a blend of diets, emphasizing portion control, calorie-counting, self-monitoring, and gradual increases in activity, starting with everyday activities. (9) These simple measures do work when people practice them. Getting away from talking about "diets" or "exercise"; rather, advise patients to make better food choices and increase physical activity. Patients on diets, special meal plans, or strict exercise programs feel deprived and usually do not complete them. In this study, patients will be encouraged to choose foods they like to eat within the context of varied, healthy choices; adherence will improve and so will success.

**Study Objective**

The central hypothesis of this study is the following: there will be a difference in the change in the body composition (and subsequent rates of obesity/overweight), of individuals who exercise, following the guidelines set out in the Physical Activity Pamphlet (PAP) combined with a dietary modification from the MyPyramid.gov website versus those who modify diet alone.
LITERATURE REVIEW

Overweight versus Obese: Definitions and Prevalence

According to the National Institutes of Health (NIH 1998), overweight refers to increased body weight that is at least ten percent over a recommended weight for their height relative to the individual. These recommended weight standards are generated based on a sampling of the U.S. population or by body mass index (BMI), a calculation that assesses weight relative to height. BMI as weight in kg divided by the square of the height in meters (or weight in pounds multiplied by 703, then divided by height in inches), is an easy way to calculate body fatness and is widely used in clinical practice (10). A healthy weight is defined as a BMI of 18.5 up to 24.9 kg/m², overweight as a BMI of 25 up to 29.9 kg/m², and obesity as a BMI of 30 kg/m² or greater. The interpretation of BMI in terms of body fatness and in comparison with a weight standard varies by sex, age, and other factors. In part because of lower muscle and bone mass, women are characterized by a higher percentage of body fat than men. Women tend to have a higher proportion of body fat stored in subcutaneous rather than visceral adipose tissue. Therefore, fat distribution may have different affects on men versus women. Because of the differences in body composition between men and women at the same BMI, women will tend to have a considerably higher percentage of body fatness compared to men. Also, older persons will usually have a higher percentage of body fat than younger people at the same BMI because of the changes in body composition that occurs when people age.
Obesity is also clinically classified as a body weight that is at least thirty percent over the ideal weight for a specified height (10). More commonly, obese refers to any individual with a BMI greater than 30 kg/m². It is important to note that although BMI correlates with the amount of body fat, BMI does not directly measure body fat. As a result, some people such as athletes may have a BMI that identifies them as overweight even though they do not have excess body fat. The rapidly rising rate of obesity is a growing health concern for all age groups in the United States. Approximately 44 million American adults — or approximately one in five — were considered obese in 2001, defined as having a body-mass index of thirty or more, according to the Centers for Disease Control and Prevention. (11) Approximately 65% of adults age 20 years and older in the United States are overweight and one-third of the population is classified as obese. (12) A smaller percentage of 4.7% is considered morbidly obese (BMI >40). This reflects an increase of 74% since 1991. Research from the U.S. Centers of Disease Control and Prevention (CDC) has also demonstrated that obesity, in combination with poor nutrition and a sedentary lifestyle, was associated with 111,909 deaths compared with normal weight people annually. (13)

It has also been shown that the association between socioeconomic status (SES) and obesity has weakened over time, even though the prevalence of obesity has increased dramatically. There are considerable variations in the changes in the associations across gender and ethnic groups, and there are currently considerable genetic research studies being conducted to validate the link between genes and obesity. These findings suggest that individual characteristics are not likely the main cause of the current obesity epidemic in the U.S., whereas social-environmental factors play an important role.
Obesity is no longer affecting the lower SES and ethnic groups of the United States. The prevalence of overweight has steadily increased over the years among genders, all ages, racial and ethnic groups, educational levels, and smoking levels. Therefore, strategies for obesity prevention and management should target all SES groups from a societal perspective.

Measuring Obesity

Other methods of estimating body fat and body fat distribution besides BMI include measurements of skinfold thickness, waist circumference, calculation of waist-to-hip circumference ratios, and techniques such as ultrasound, hydrostatic weighing, computed tomography, and magnetic resonance imaging. To account for the individuals who have differing amounts of lean muscle mass, this study will also be using the BOD POD (air-displacement plethysmography) to measure body density. This should eliminate problems with individuals who have higher amounts of lean body tissue that would give them higher BMI measurements.

There are also several hormones and other chemicals that may serve a role in obesity, such as leptin and C-reactive protein (CRP). Studies conducted by Rosenbaum et al. revealed that leptin deficiency promoted weight regain by stimulating appetite and reducing energy output (14, 15). In a more current study, a decline in leptin served as a key metabolic signal to modulate the reward and executive control of visual food stimuli (16). The ability of leptin replacement to reverse these changes suggests that leptin itself or drugs that stimulate leptin signaling may facilitate the maintenance of weight loss. A similar effect is hoped to be gained in this study through exercise implementation.
CRP is strongly related to total and central abdominal obesity, blood pressure, and lipid levels, independent of genetic influences. These relationships are likely to contribute significantly to prospective associations between CRP and Type-2 diabetes and coronary events. Higher BMI has also been associated with higher CRP concentrations, even among young adults aged 17 to 39 years. (17) These findings suggest a general state of low-grade systemic inflammation in overweight and obese persons. This inflammation leads to higher risks for several chronic diseases, and the exercise regimen will help to reduce this inflammation through weight loss and improved cardiovascular function.

Expenses and Costs

Obesity has been identified as one of the more serious health risk factors facing many individuals and society as a whole. The cost that is associated with the loss of life and medical expenses is significantly greater than that of smoking, excessive drinking, and poverty (18). The recent increases in the prevalence of overweight and obesity are reflected across all ages, racial and ethnic groups, and education levels in the U.S. The estimated dollar increase in overall health cost for each of the following categories is obesity 36%, smoking 21%, and heavy drinking 14%. (18) Being obese or overweight increases medical cost, plus has a direct financial effect on industry as a whole. Based on research by MetLife, the CDC, and the American College of Cardiology, three key conditions linked to obesity — diabetes, arthritis, and heart disease — cost employers more than $220 billion annually in medical care and lost productivity.

Scientists at RTI International Health, Social and Economics Research, and the Centers for Disease Control and Prevention compared figures that included BMI, sick
days, and total medical expenditures. The researchers found that as BMI increased, so too
did medical expenses for both men and women. The additional costs ranged from $162
for slightly obese men to an extra $1,524 for men with a BMI greater than 40. For
overweight women, these costs ranged from $474 to $1,302. When the team factored in
the cost of lost work days for obese employees, they calculated that the per capita cost of
obesity amounts to between $460 and $2,485 annually.

Obese subjects may earn less than their lean counterparts because of job
discrimination. This may be related to the stigma associated with obesity, or due to
diseases and disabilities caused by obesity. Many insurance companies (particularly life
and health insurance) often charge higher premiums with increasing degrees of
overweight, as well as for smokers. Obesity is further related to poor physical
functioning, decreased efficiency, and limitations in daily life. Some of these require
assistance or adaptations which may also add to the cost for an individual.

The direct costs from lack of physical activity, defined conservatively as absence
of leisure-time physical activity, are approximately 24 billion dollars or 2.4% of the U.S.
health care expenditures. Direct costs for obesity, defined as BMI greater than 30, totaled
70 billion dollars in 1995. These costs are independent of those resulting from lack of
physical activity. (19) Overall, the direct costs of inactivity and obesity account for nearly
10% of the national health care expenditures in the United States. Inactivity, with its wide
range of health consequences, represents a major avoidable contribution to the costs of
illness in the United States and other countries with modern lifestyles that have replaced
physical labor with sedentary occupations and motorized transportation.
A 2003 study found obesity and overweight conditions contribute as much as $93 billion to the nation's annual medical bill. Many employers say they already have overburdened their employees by shifting costs to them through everything from high-deductible health plans to higher co-pays and out-of-pocket limits. With costs relating to health and productivity accounting for at least 20% of industry’s traditional payrolls, employers may have a significant opportunity to influence their bottom lines. That is why employers should examine the potential savings from exercise or wellness programs that involve changes of employees’ behaviors at work and at home.

Absenteeism and Health Risk

There is a direct correlation between an increase in BMI and the increase in the average number of sick days. According to the World Health Organization, it has been estimated that 10% of the total loss of productivity resulting from sick leave and disability in women is related to obesity or obesity-related disease. (20) In a study by Tucker and Friedman, obese employees were more than twice as likely to experience high-level absenteeism (seven or more absences due to illness during the past six months), and 1.49 times more likely to suffer from moderate absenteeism (three to six absences due to illness during the last six months) than were lean employees. With all of the potential confounders controlled simultaneously, obese employees were 1.74 and 1.61 times more likely to experience high and moderate levels of absenteeism, respectively, than were lean individuals. (21) Studies have also shown that a higher percentage of individuals on disability pension are classified as overweight or obese.
There is increasing evidence that supports modest reductions in weight improve obesity-related risk factors and death. A few studies have also suggested that weight loss improves the quality of life. Many debilitating chronic diseases are associated with obesity and BMI greater than 30 kg/m². Arthritis, primarily osteoarthritis, is the leading cause of disability in the United States and obesity is a risk factor for arthritis. Recent data reported that one third of U.S. adults had arthritis based on either chronic joint pain or a doctor’s diagnosis. One study showed a strong relationship between BMI and arthritis. The prevalence of arthritis was 25.9% in the normal weight group, 32.1% in the overweight group, and 43.5% in the obese group. (22) Weight loss would be important to decrease this painful disease.

High blood pressure is a major health concern in the U.S. affecting more than 50 million people. Blood pressure can be reduced pharmacologically in hypertensive people, but anti-hypertensive medications are not effective for everyone, and they are costly, and could result in adverse effects. Instead, weight loss is recommended as an alternative for the reduction of blood pressure. (23) Morbidity and mortality are highly associated with hypertension. Observational studies have shown that an increase in blood pressure from 5-6mm Hg causes an increase risk of stroke by 35-40%, and a 20-25% increased risk of ischemic heart disease. Myocardial infarction and stroke are not directly related to an increase in blood pressure, but may result from the structural changes in the heart and blood vessels. Several studies have shown that weight loss leads to a significant reduction in blood pressure (23), which would lead to less damage and/or changes in the hearts and surrounding vessels of these patients.
Obesity is also a major risk factor for the development of Type-2 diabetes, so it is not surprising that studies show 87.6% of this group is overweight or obese. Diabetes is very prevalent and is on the rise in the U.S., and Type-2 diabetes is associated with high health care costs for many businesses. This cost stems from treating complications of the disease. One study showed that 60% of those with diabetes have neuropathy, 97% of those taking insulin and 80% not taking insulin have retinopathy, and around 14% of those ages 45 to 64 have coronary heart disease. The main risk factors for diabetic complications are poor glycemic control, hypertension, lipid disorders, and obesity. The recommended treatment and control measures for Type-2 diabetes are weight loss and reduced BMI. (24)

Work Efficiency

Dempsey et al. (25) reported in a cross-sectional study that, as the workload increased, oxygen consumption increased more rapidly in obese than in lean subjects, leading to the decreased efficiency in obese subjects. This shows that any physically demanding job is performed more efficiently by a leaner individual. A study by Chen et al. (26) showed a decrease in efficiency of walking at normal speed with the increase in body fatness in both men and women. This has direct correlation for many jobs that use walking as part of their required tasks.

Fuel economy and work efficiency may be increased following energy restriction and weight loss. (27) There have been several studies done that evaluate the potential change in muscle fiber types and muscle efficiency in those that begin exercise regimens. Regular exercise increases capacity of oxygen in lungs, increases mitochondria in cells,
and increases the ability of the body to do work longer from increased endurance. It can also help change muscle fiber types and enzyme activity in muscle cells. Training also helps improve efficiency of that activity. Athletes are more energy efficient than sedentary counterparts when measured indirectly. Substantial data suggests that obese individuals oxidize proportionally more carbohydrate and less fat than lean subjects. (28)

**Body Density**

Air-displacement plethysmography has gained popularity among body composition researchers since its introduction in 1995. This is mainly attributable to the non-invasive test procedure and the lack of technical expertise required compared to the traditional hydrostatic weighing (HW) procedure. Air-displacement plethysmography offers several advantages over established reference methods, including a quick, comfortable, automated, noninvasive, and safe measurement process, and the accommodation of various subject types (e.g. children, obese, elderly, and disabled persons).

The BOD POD utilizes the inverse relationship between pressure and volume (Boyle’s law) to measure body volume directly. A previous study indicated that body composition estimates by the BOD POD are not significantly different from those determined by hydrostatic weighing (29). Thus, a chief advantage of the BOD POD is that it represents a densitometric method based on air displacement rather than on water immersion. It is therefore simpler and more rapid than HW and has potentially wider clinical application for future studies.
It is generally accepted that for young males, a value of 20% fat represents borderline obesity and 30% fat for older men. For young women, borderline obesity begins at 30% fat and 37% fat for older women. For many, this is not an overnight phenomenon, but an addition of weight slowly over time. Studies show that the average American male will gain approximately one pound per year — and for most, this is fat — until age 60. (30) The goal of this study is to prevent entirely, reverse, or slow that weight gain. This will be accomplished through a dietary intervention involving education for employees and a physical activity regimen to be used outside of the workplace involving simple exercises and education to maintain current body composition or reduce body fatness.

Treatment Options

Those trying to lose weight are quick to embrace the latest popular diet but are almost as quick to abandon it. This observation is evidenced by the rise and the apparent recent decline in the popularity of low-carbohydrate, high-fat diets in the United States. Noakes et al (31) report the results of a 12 week study that evaluated high-protein (HP) diets intended for weight loss versus high-carbohydrate (HC) diets. First, Noakes et al found that the hypocaloric HP diet produced weight loss comparable to that of the HC diet and provided nutritional and metabolic benefits that were equal to or in some cases greater than those seen with the HC diet. Second, in a post hoc analysis, they found that obese subjects in the top 50% of blood triacylglycerol concentrations at baseline lost more weight with the hypocaloric HP diet than with the hypocaloric HC diet. Thus, the
study is noteworthy in that it suggests that high-protein diets are effective at both producing weight loss and improving risk factors for diabetes and heart disease.

We need research studies to answer at least two important questions: 1) Can high-protein diets be maintained permanently? 2) Can high-protein diets help persons to permanently maintain their weight loss and the metabolic improvements they achieve? Answering these questions will require studies that focus not just on weight loss but on the long-term maintenance of weight loss. These studies will be difficult and expensive to conduct; however, without them we cannot provide the best advice on which diet is best for weight maintenance and whether the best diet for weight-loss maintenance varies from person to person. Diets, for weight-loss by themselves, have also been historically hard to follow or have too many restrictions for most individuals.

Diet composition can play a role in obesity treatment because it can influence energy intake and nutrient balance. The greatest potential effect of diet composition occurs not during weight reduction but during maintenance of a reduced body weight. During weight reduction, the extent of negative energy balance is the greatest determinant of the amount and rate of weight loss, and any effects of diet composition are likely to be very small. Conversely, during the maintenance period after weight reduction, maintenance energy requirements are reduced and the rate of fat oxidation may be low. This is why a diet modification in addition to the exercise regimen is recommended to work synergistically for maximal results.

Prevention of fat storage and regain of body weight can be achieved either by increasing fat oxidation (for example, by increasing exercise) or by reducing the fat content of the habitual diet. Although diet plans high in protein and fat and low in
carbohydrates are gaining in popularity, some of them may pose serious health risks in the long run because of the emphasis on saturated fat. Successful weight loss that is maintained over a long period of time depends more on limiting energy consumed (calories) and increasing energy expenditure (exercise and daily activity) than the composition of the diet. Fasting may result in rapid weight loss, but lean muscle mass is lost as well as fat. All-liquid diets must be medically supervised and may be used for a short period of time in people who are obese, but these diets are not the long-term answer to weight loss. The treatment with the greatest chance for success would combine a reduced-fat diet with some form of daily exercise regimen.

Support for the effectiveness of exercise on cardiovascular disease risk factors is evident from the Senior Hypertension and Physical Exercise study, which has shown that exercise reduces both total and abdominal body fat, increases muscle mass, and ameliorates the risk factors that make up the metabolic syndrome. (32) Data from the Cooper Clinic further show the importance of fitness in the health of older adults and show that if fit, obese individuals have a lower risk of all-cause mortality than unfit, normal-weight, or lean individuals. (33) Exercise has an inherent mild weight loss effect and may have a significant beneficial impact on body composition, the risk factors associated with metabolic syndrome, and cardiovascular and metabolic disease in the working population. Current research and exercise guidelines recommend the inclusion of resistance training for healthy persons of all ages and many patients with chronic diseases, including cardiovascular disease. (34)

Exercise and caloric restriction or fat-restricted diets have many benefits for the physical body, especially weight loss. Weight loss induced by increased daily physical
activity without caloric restriction substantially reduces obesity (particularly abdominal obesity) and insulin resistance. Exercise without weight loss reduces abdominal fat and prevents further weight gain. (35) Many different types of diets can produce substantial weight loss in the short term. Most obese persons attempting to lose weight do not fail in losing the weight but rather fail in maintaining the weight loss, and an exercise regimen can help improve the chances of maintaining weight loss.

It should be noted that the mechanisms of energy balance are not as tightly regulated in old age, and the response to a negative energy balance is attenuated. Older adults may experience greater loss of muscle mass with intentional caloric restriction compared with younger adults. A study by Weiss et al. showed that in older men and women, muscle mass and absolute work capacity decreased in response to twelve months of caloric restriction but not in response to a similar amount of weight loss induced by exercise. (36) This study will be looking at working age individuals between the ages of 25 to 49 who are looking to lose weight through exercise and are physically able to do so.

**Benefits of Physical Activity**

A typical day for most US adults encourages a sedentary lifestyle and becoming active takes some effort. Use of the automobile and working at a desk restrict activity. Watching television is a sedentary activity that can contribute to an inactive lifestyle. Exercise benefits people who are obese by helping to keep and add lean body mass, or muscle tissue, while losing fat. It also helps to increase the rate at which weight is lost if a person is eating healthy food according to a meal plan because muscle tissue has a higher rate of metabolism, thus burning calories faster.
Exercise in any form has been shown to help with the following: improve mood, prevent or improve outcomes of several chronic diseases, help people maintain weight, strengthen heart and lung function, promote better more restful sleep, improve sex life, and is often entertaining. The right combination of exercise and nutrition creates an internal environment conducive to fat loss, increased muscle strength, and increased energy. Research has confirmed that any amount of exercise at any age is beneficial and has a direct effect on lowering rates of obesity/overweight. And, in general, the more you do, the greater the benefits. Most work suggests that exercise and physical activity are associated with better quality of life and health outcomes. Therefore, assessment and promotion of exercise and physical activity may be beneficial in achieving desired benefits across several populations. (37) The National Academy of Sciences has recommended that everyone strive for a total of one hour per day of physical activity. The hour can be made up of several shorter bursts of activity done through the day at home or at the workplace. These activities may include walking, gardening, doing laundry, and even heavy housecleaning.

Regular physical activity also reduces the risk for several diseases including heart disease, adult-onset diabetes, high blood pressure or hypertension, breast cancer, osteoporosis, arthritis, and colon cancer. Reports have shown many health problems are attributed to lack of physical activity, including hypertension and Type-2 diabetes. Regular exercise that affects various functions and subsystems of the human body is beneficial throughout life. There is growing evidence that exercise prevents at least some of the negative consequences of menopause such as bone loss, increased risk of coronary heart disease, or chronic diseases (e.g., diabetes). (38) In particular, bone loss often
accelerates significantly with the onset of menopause. Research has also shown a direct link between immune system function and exercise. There is a direct linear relation between physical activity and health status, such that a further increase in physical activity and fitness will lead to additional improvements in health status. (39)

Weight management is a highly effective tool for preventing obesity through regular physical activity to lower weight. It may be useful to consider weight management as consisting of two different phases: achieving weight loss and maintaining weight loss. The strategies that work for losing weight may not be effective for keeping weight off. This has been found to be the case in a review of the National Weight Control Registry, which follows 5,000 people who have succeeded in maintaining weight loss in the long term. (37) When it comes to choosing a low-calorie diet, one size may not fit all. However, keeping weight off requires the achievement of a permanent balance between energy intake and energy expenditure. Here is where physical activity becomes critically important and may even be more important than diet composition (40).
METHODS

Participants and Selection:

A total of 100 mobile subjects (between the ages of 25 and 49) with a BMI greater than 25kg/m² will be recruited. Subjects must be without any history of severe cardiovascular diseases or any other chronic or acute diseases that may affect their ability to follow an exercise regimen or change their dietary patterns. Baseline characteristics and measurements will be taken during a single visit to the study site. During this first visit, potential subjects who meet the screening criteria will then be provided with a verbal and written description of the project and with answers to any questions regarding their participation in this study. At this time, the potential subject will be assured that his/her participation is completely voluntary. Also at this time, body weight and anthropometric measurements, and caliper readings will be obtained from all the study participants. Background information will also be accessed through records of absenteeism and the BOD POD will be used for determining body composition at baseline.

Finally, the subject’s brief dietary and physical activity patterns will be assessed using the Physical Activity Assessment Tool (PAAT). Subjects will then be randomly assigned to the placebo group, exercise modification only group, or the dietary modification/exercise regimen group for a period of three months. The subjects will be followed up monthly by phone on a random-date cycle to monitor their compliance to the appropriate treatment using the same questionnaire. The PAAT is used to ascertain dietary patterns, the amounts of strength training, and moderate and vigorous exercise
patterns for each week. It is hoped that educating employees on the benefits of exercise using the Physical Activity Pamphlet (PAP) and dietary change will yield an increase in the amount of physical activity and/or beneficial dietary changes, and will be measured through positive changes in body composition and weight.

**Screening**

Assessment for identification of potential subjects will involve a short medical history questionnaire that will be conducted over the phone under the supervision of the principal investigator. This screening will identify the potential subjects who will be interested, and those who qualify for the study based on the required inclusion criteria of age and BMI.

**Risk / Benefit Assessment**

This study will examine the direct benefits from dietary modification and exercise regimen on improved daily healthy living and increased workplace efficiency. The findings of this study, if positive, could help promote a way for workplaces to provide the tools for employees that will yield higher productivity, reduced absenteeism, and lower risks for chronic diseases. The cost to provide this information for employees is very small; however, providing free access to exercise equipment or facilities may prove to be costly. The research subjects will have access to the results of analyzed data gathered from the questionnaire along with the interpretations of results, upon request. Subjects will also have access to the principal investigator in regards to any dietary or nutrition
related concerns. If needed, subjects may also be referred to a registered dietitian (RD) for further counseling.

Risks associated with participation include minor discomfort with measurement of body composition and inclusion of exercise in daily life. To reduce the degree of discomfort, study participants will be advised to wear loose fitting clothes and provided a Speedo swimsuit for use in the BOD POD after changing.

Assessment of Body Composition, BMI, and Anthropometrics

Air-displacement plethysmography has been a widely used and an acceptable method of assessing body composition in individuals of all ages with little discomfort. The BOD POD from Life Measurements, Inc. has been validated for this type of assessment. This machine is housed in the Department of Nutritional Sciences Assessment laboratory and would be accessible to the subjects and investigators. Furthermore, the assessment laboratory has instruments to accurately measure body weight, as well as calipers to obtain anthropometric measures such as skin-fold thickness as proposed in the study.

Dietary Modifications and Exercise Regimen

After randomization, subject in both treatment groups will be asked to modify their dietary intake of calories, cholesterol, sodium and potassium. Furthermore, these individuals will be provided with dietary guidelines to increase their intake of vitamins and minerals in relation to their antioxidant and metabolic properties by adopting a diet closer to the Guidelines for Americans in 2005 based on the Food Guide Pyramid on the MyPyramid.gov website. Subjects in the exercise regimen group will also be educated on
incorporating an exercise regimen to their daily routine. They will be provided with information on the benefits of exercise at home or on the job during breaks, using the PAP. The compliance of the study participants will be monitored through monthly phone calls and a mailer to track their weekly activity, utilizing the PAAT, and assess any dietary pattern changes.

Data Analysis and Monitoring

Descriptive statistics, comprising means, standard deviations, minima, and maxima, will be calculated for all variables. Distributions of the response variables will be examined to determine if statistical tests of hypotheses, based on the assumption of normality, are appropriate or whether transformed data or non-parametric tests should be used. Baseline values of body weight, body mass, and anthropometric measurements and relevant covariates such as age will be compared for the two groups (dietary modification only versus dietary modification and exercise regimen) using a student t-test. The proportion of patients in each group with improvement in body composition will be compared using logistic regression. If indicated by preliminary analysis of baseline values, the logistic regression models will include adjustment for age and other relevant covariates.

Upon entrance in to the study, each subject will be assigned a subject identification number. This number will be used for tracking the volunteer’s records throughout the study. Individual folders will be utilized for each research participant where the content will include all of the forms and questionnaires used in data collection during the entire study period. These folders will be kept in a secured file drawer located
in the principal investigator’s office. A tracking sheet will be initiated for data that is placed into each participant’s folder with the date of entry.

Raw data entry using data spreadsheet software (Microsoft Excel with ActiveX controls for checkboxes) with the appropriately designed spreadsheet will be done on an ongoing basis by a trained graduate student as well as an undergraduate student helper on a weekly basis with signed assurance from each person authorized to work on the database. Data will be double-entered as a measure of quality control, and a tracking sheet will be maintained. Thereafter, data entry will be validated and cleaned using appropriate software. The computer entry of data will be performed on a secure computer which will have limited access to those individuals who are working on the research study. The spreadsheet data will be saved on the principal investigator’s hard drive as well as backup data will be stored on two zip diskettes. The data diskettes will be stored under lock and key in the principal investigator’s office.

Setting

Study participants will be asked to make two visits throughout the study period. These visits will be to the UC Medical Center, and parking will be provided at no cost to the study participants in Eden Garage. This garage is adjacent to the location of the visit site which is housed in the College of Allied Health Sciences (CAHS) in the French East Building. The building is easily accessible and has two elevators (one located near the main entrance on the south side and the other towards the north end of the building). During the scheduled visit, study participants will be requested to come to the Human Assessment laboratory located on the first floor of the this building. All aspects of the
The research protocol will be conducted in this laboratory. The assessment laboratory provides the necessary space as well as the privacy to collect the proposed physical measurements of body composition, caliper readings, and anthropometrics.

_Laboratory Methods and Facilities_

Air-displacement plethysmography has been a widely used and an acceptable method of assessing body composition. The BOD POD from Life Measurements, Inc. has been validated for this type of assessment. This machine is housed in the Department of Nutritional Sciences Assessment laboratory and is accessible to the principal and co-principal investigators. Furthermore, the assessment laboratory also has instruments to accurately measure body weight as well as caliper to obtain anthropometric measures, such as skin-fold thickness, as proposed in the study.

_Physical Activity Plan_

The Physical Activity Plan (PAP) was developed to help employees who have a BMI greater than 25kg/m² (overweight) or higher to help them lose weight and be healthier. It outlines several ways to add exercise to daily life in simple ways. This is an easily carried pamphlet with helpful reminders of the exercise education and diet education the employees would have received. It contains a description of the activities that constitute moderate exercise versus vigorous exercise, and strength training. It also has the ways to determine the differences between the three of them. It lists the recommended amount of activity for each week and has the 2005 dietary
recommendation for Americans, including recommended foods and food groups, and weight management tips.

The PAP also has three tables to help employees: a conversion table for walking step equivalents for various activities; a list of calories burned for common activities; and some dietary tips for healthy snacking between meals. To supplement the tables, a list of ways to increase the steps a person takes in a day is also provided. These core concepts are a convenient way to emphasize an increase in the amount of physical activity daily/weekly and some simple tips for dieting to help with weight management or loss. The ideas center around increasing the expenditure of calories combined with a more balanced diet to incorporate healthier food choices and decrease calories consumed daily/weekly. The subjects who meet the inclusion criteria will be asked the questions from Physical Activity Assessment Tool (PAAT) to determine baseline characteristics and improvements.

*Physical Activity Assessment Tool*

The Physical Activity Assessment Tool provides 44 straightforward questions, which takes no more than 10 minutes to complete. Using the PAAT tool will provide a baseline of the weekly exercise and some dietary habits of the participants prior to receiving the PAP to measure any impact from the use of the PAP. The tool includes check boxes, which can be accessed through Excel ActiveX controls for the responses. They are divided into headings for the different subcategories addressed. A total number of steps have been asked as an estimate. The diet questions, and questions about activities that relate to steps, range from Usually/Often to Rarely/Never, which can be scored from
a 1 to 3 respectively. There is also a Does Not Apply category for habits that do not apply to the participant and should not be scored. The exercise questions ask for duration each week, and are divided from 0-60 minutes to 300 minutes or more, which can be scored 1 to 6 respectively.

The PAAT questions pertain to the exercise habits and some dietary habits of the participants. Included are questions about how many steps are taken, how much moderate and/or vigorous aerobic activity, and how much strength training is done each week. There are also questions regarding the frequency of proper dietary habits. These questions provide insight into the health habits of the participants, including exercise and dietary habits. This also goes further by addressing which types of strength training and which exercise activities are done most frequently. They are divided into several subcategories for easy interpretation and classification:

**Subcategories:**

1. **Steps** – How many steps does the subject take in a day? This also involves being able to convert steps from exercises as shown in the PAP.
2. **Moderate Exercise** – How much total moderate exercise is done each week? This section also asks for how much of each type of exercise is done.
3. **Vigorous Exercise** – How much total vigorous exercise is done each week? This section also asks for how much of each type of exercise is done.
4. **Strength Training** – How much total strength training is done each week? This section also asks how much of each type of strength training is done.
The questions in each subcategory are designed to find out what types of exercises are done. There are 44 total questions: 11 questions that address how many steps are taken in a week; 10 questions about moderate exercise; 8 questions about vigorous exercise; 8 questions about strength training; and 6 questions about dietary habits. This information can be used to design exercise programs for employees with similar interests in the future. It will also be useful to see what types of activities are most common for employees.

To implement this program at a service industry, the potential participants would need to be informed of the study to test the PAP. First, an email would be sent out to all employees about a research study being conducted on an exercise program that would be available to those interested in losing approximately 15% of their weight through exercise and making better food choices to improve their health. The email would instruct interested parties to contact the principal investigator through email or by phone to be screened for eligibility in the study.

The employees that contact the principal investigator will be screened to determine their present BMI and ability to be in the study. Those with a BMI of 25kg/m² or more, and that meet the inclusion criteria would be invited to the study site for further evaluation if they are interested. A total of 100 participants would be desired after screening is complete. Once 100 people have been selected and informed of their participation in the study, anthropometrics would be taken at the assessment lab during the initial visit, such as height, weight, and caliper testing. Each participant will also be evaluated using the BOD POD for body composition.
They would be randomly divided into the two groups, and instructed on where to obtain the information from a website. They will be assigned a subject number based on their group. This site will provide limited access for those in the diet group, and full access for those in the exercise and diet group, and use their subject number for access. This site will contain the PAP and PAAT for completion each month at participant’s leisure. They will be asked to follow the PAP to increase their physical activity each week, and directed to MyPyramid.gov through a link for dietary advice. MyPyramid.gov contains information that can be applied to anyone, regardless of previous exercise experience or current physical activity level. The PAP includes several ways for participants to increase moderate or vigorous activity and what constitutes each. It also speaks of strength training in addition to exercise for maximal results, and how much activity is ideal.

The PAAT will be evaluated for changes in behavior over a three month period and measure their compliance, using statistics to assess trends. At the end of three months, the subjects will be asked to return the lab for final measurements. The anthropometrics and BOD POD measurements after three months will be used to validate the changes assessed using the PAAT and the effectiveness of the PAP and dietary advice in regards to changes in body composition.
DISCUSSION

There are many environments where health promotion and wellness programs can be effective including workplaces, communities, and schools. Workplaces are a great place to offer a wellness program because men and women spend more time at work than at any other activity except sleeping. Continued voluntary participation in worksite wellness programs is often much higher than in one-time events, especially when combined with pamphlets for ease-of-use, and a simple and easily understood website. Workplace wellness programs bring both tangible and intangible benefits to both employees and the employers. Wellness program components can vary from program to program but usually have the common goal of raising awareness, reinforcing positive behaviors, and helping participants develop tools for behavior change. (41)

This study’s focus is on providing exercise options to employees from their employers in order to reduce costs associated with healthcare and lost production. It is believed that it would be in the best interest of companies to offer these types of services to their employees at the workplace or off-site. Many employers are starting to see the benefits of shifting emphasis from treatment-oriented health care to less costly, prevention-oriented wellness programs. Benefits for a company with healthier employees include reduced medical and disability cost, increased employee productivity, decreased employee absenteeism, improved employee morale and job satisfaction, and improved corporate image.
The job site is a great place for intervention strategies for employers to reach their employees. Employees usually eat at least one meal during working hours, whether at the job site or nearby during a meal break. They may also consume a snack while working. The workplace is a convenient way to reach employees in large groups through emails, meetings, conferences, etc. Information is shared rapidly at workplaces through employees’ interactions with each other. The job site also allows the employer to provide resources and incentives to increase compliance. This information may also reach the families of employees who can benefit or motivate them as well.

Another reason to implement a wellness program is job satisfaction from employees. Job satisfaction is typically defined as an employee’s level of positive affect toward his/her job. It is often thought to develop as a response to the characteristics of the employees’ jobs, or by the characteristics of the organizations in which they work. (42) It has been suggested that providing worksite wellness programs will create a positive attitude toward the company, making employees happier with what the organization provides and therefore more satisfied with their jobs. (43)

One explanation is that an organizational wellness program can make employees feel better physically. Physical well-being has been shown to have a direct affect on general happiness and job satisfaction in a study by Kirkcaldy et al. on police officers. (44) Several other meta-analysis studies show participation in wellness programs is associated with higher job satisfaction of employees. To validate this, the existence of a wellness program may indicate to employees that their employer values them and cares about them as individuals with needs. Furthermore, it is assumed that wellness programs are attractive to potential employees, and may thus be useful as recruiting and retention
tools. In particular, employees who value physical fitness may be more drawn to an organization that provides wellness opportunities on and off the jobsite. This would contribute to higher retention rates of more physically fit and efficient employees, which would yield higher productivity. Lastly, in studies by Jebb, S.A., exercise and physical fitness were shown to be related to reduce stress levels and rates of obesity. (45, 46) This leads to lowered costs for employers and less healthcare costs to be covered by insurance policies. Decreased stress at work leads to more satisfied employees and better health for their families as well.

Nutrition information that can be used in wellness programs can be as simple as education on food labels or using food guides. Since the early 1900’s, the United States Department of Agriculture (USDA) has been issuing food guides designed to help consumers choose diets that meet recommendations based on scientific literature. Graphics and illustrations that show the information in these food guides helps play an important role in conveying dietary advice to consumers in a way that is easily understood. Several have been issued over the years, the most well-known being the Four Food Groups, and eventually the Food Guide Pyramid.

The Food Guide Pyramid was first issued in 1992 by the USDA and the US department of Health and Human Services. The Pyramid was designed after extensive market research and testing. It was found to be the graphic best suited to convey important principles on which all Americans should base their diets, and nutrition interventions based on overall dietary patterns are advocated. The revision of the Pyramid in 2005 added “Steps to a Healthier You” to demonstrate the need of physical activity to daily life for everyone. It also has a website associated with it to help provide a way for
people to follow their dietary and exercise patterns to see improvements as a self-directed means for positive change. That is why this website and information was selected for this study. Clinical studies have found that nutrition interventions based on overall dietary pattern changes are effective in improving healthy related outcomes.

A wellness program that would utilize the PAP and MyPyramid.gov would be an inexpensive way to encourage physical fitness, healthy eating behavior, and possibly improve job satisfaction and reduce absenteeism. If volunteers used the PAP and followed the recommendations on the website for a three month time period, they may have a reduction in weight, a favorable change in body composition, and/or an improvement in health or feelings of well-being and motivation. Even modest weight loss can result in important reductions in chronic disease risk including blood pressure, blood lipids, and blood glucose levels. (47)
LIMITATIONS

The main limitation is that a research study has not been done on the PAP to determine if this guide would be an effective exercise pamphlet to use in a corporate wellness program to change physical activity among employees. It is assumed that enough employees would be interested in participating in a program to receive the PAP and education on dietary changes. It is also assumed that they would follow the suggested information to try to improve their physical activity regimen and dietary patterns, which could positively impact their health.

This study would not show if it changed behaviors or trends over a long time period, since it is only three months in duration. Furthermore, requesting participants that have a BMI greater than 25kg/m^2 would eliminate other potential participants that may have been motivated and would have liked to use the tool to improve their healthy lifestyle. These participants would also be from a service industry, which may not correctly represent the average population of overweight people. There is not a control group in place to measure other aspects of the study. An exercise education piece cannot be expected to change behavior alone, but it can enhance the learning process coupled with other motivational strategies. It is believed that the PAP would achieve optimal results when combined with some form of dietary intervention.

Several important questions should be addressed if this study shows positive results:

1. Would the PAP continue to be used after the completion of the study?
2. Are the PAP and PAAT easy to follow and understand?
3. Are the PAP and PAAT a useful guide to help shape exercise and dietary behaviors?

4. Would employees be motivated to use the PAP without an incentive provided by their employers or as part of a wellness program?

5. How effective would this be for other populations outside of service industries?

6. Would the PAP and PAAT be effective for populations not overweight/obese?
LITERATURE CITED


Physical Activity Plan and Dietary Suggestions

Ideas to help you lose weight and maintain optimal physical health

Controlling Your Weight

Calories In > Calories Out = Weight Gain (BAD!)
Calories In = Calories Out = Weight Control (GOOD)
Calories In < Calories Out = Weight Loss (BETTER)

Adding Steps for a Better Life

- Park in the far back of the parking lot and walk further to the door
- Get off the bus a stop or two before your usual stop and walk the rest of the way
- Use the furthest entrance into your workplace from your parking spot or bus stop, and walk through the building to your work area
- Don't stand, pace - when waiting for the bus, waiting at an elevator, etc. pace around in circles rather than just standing
- Circle the room when waiting for meetings to start
- Use the restroom, copy machine, water fountain, break room, etc. that is further from your work area
- Take the stairs rather than the elevator, especially for one to three floors, both up and down
- When making a phone call, stand up and pace around as you talk
- Rather than phone or email, walk to a coworker's office or neighbor's house and talk to them live in person
- When people stop to talk with you, make it a moving meeting and walk around together while chatting
- Hide the TV remote and walk to the TV to change channels
- During TV commercials, get up and walk around the house
- When doing errands, park in a central location and walk to your store destinations
- Return the shopping cart all the way into the store after grocery shopping
- Never drive through - get out and park and walk into the bank or fast food stop instead

Table 1: Walking Steps Equivalents

- 1 mile = 2100 average steps
- 1 block = 200 average steps
- 10 minutes of walking = 1200 steps on average
- Bicycling or swimming = 150 steps for each minute
- Weight lifting = 100 steps per minute
- Rollerskating = 200 steps per minute

Table 2: Calories Burned in Common Physical Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Calories Burned Per Hour*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hiking</td>
<td>370</td>
</tr>
<tr>
<td>Light gardening/yard work</td>
<td>330</td>
</tr>
<tr>
<td>Dancing</td>
<td>330</td>
</tr>
<tr>
<td>Golf (walking and carrying clubs)</td>
<td>330</td>
</tr>
<tr>
<td>Bicycling (less than 10 mph)</td>
<td>290</td>
</tr>
<tr>
<td>Walking (3.5 mph)</td>
<td>280</td>
</tr>
<tr>
<td>Weight lifting (general light workouts)</td>
<td>220</td>
</tr>
<tr>
<td>Stretching</td>
<td>180</td>
</tr>
</tbody>
</table>

*Calories burned will be higher for persons who weigh more than 154 pounds and lower for persons who weigh less.

Table 3: Tips for Healthy Snacking at work or home

- Eat foods in their original form (raw orange is better than juice)
- Use whole-wheat versions of crackers or bread
- Have a cup of fruit already prepared
- Have celery with cream cheese or peanut butter
- Eat string cheese
- Eat low-fat yogurt
- Have 1 oz of mixed nuts
Different Types of Exercise

**Moderate Aerobic Exercise**
- **How Long**: A minimum of 30 minutes a day. The 30 minutes can be broken up into 10 minute increments.
- **How Often**: At least 5 days a week.
- **What Does Moderate Feel Like?**: A moderate level of activity noticeably increases your heart rate and breathing rate. You may sweat, but you are still able to carry on a conversation.
- **Kinds of Exercise**: Brisk walking, easy jogging, treadmilling, elliptical trainer, bike riding, swimming, dancing.

**Vigorous Aerobic Activity**
- **How Long**: 20 minutes.
- **How Often**: At least 3 days a week.
- **What Does Vigorous Aerobic Exercise Feel Like?**: You are breathing rapidly and only able to speak in short phrases. Your heart rate is substantially increased and you are likely to be sweating.
- **Kinds of Vigorous Aerobic Exercise**: Running, cycling, or swimming at an intense level.

**Strength Training**
Moderate or vigorous aerobic activity is needed, but you also need strength training exercise two days a week.
- **How Many**: Do eight to 10 strength-training exercises, eight to 12 repetitions of each exercise.
- **How Often**: Two days each week.
- **What Are Strength Training Exercises?**: Strength training exercises have you lift, push or pull to increase muscle strength and endurance. These include lifts with dumbbells and barbells. You may also use resistance bands or gym equipment.

**Physical Activity Recommendation**
- **Each Week**: Do 2 hours and 30 minutes a week of moderate-intensity (such as brisk walking) or 1 hour and 15 minutes (75 minutes) a week of vigorous-intensity aerobic physical activity (such as running) or an equivalent combination of moderate-intensity and vigorous-intensity aerobic physical activity. These aerobic activities should be done for at least 10 minutes at a time, and it is best to spread them out throughout the week.
- You get more health benefits by increasing to 5 hours (300 minutes) a week of moderate-intensity aerobic physical activity or 2 hours and 30 minutes a week of vigorous-intensity physical activity, or an equivalent combination of both.
- **2 or More Days a Week**: Do muscle-strengthening activities that involve all major muscle groups two or more days per week.

**2005 Dietary Guidelines**

**Adequate Nutrients within Calorie Needs**
- Consume a variety of nutrient-dense foods and beverages within and among the basic food groups while choosing foods that limit the intake of saturated and trans fats, cholesterol, added sugars, salt, and alcohol.
- Meet recommended intakes within energy needs by adopting a balanced eating pattern, such as the U.S. Department of Agriculture (USDA) Food Guide or the Dietary Approaches to Stop Hypertension (DASH) Eating Plan.

**Weight Management**
- To maintain body weight in a healthy range, balance calories from foods and beverages with calories expended.
- To prevent gradual weight gain over time, make small decreases in food and beverage calories and increase physical activity.

**Food Groups to Encourage**
- Consume a sufficient amount of fruits and vegetables while staying within energy needs. Two cups of fruit and 2 1/2 cups of vegetables per day are recommended for a reference 2,000 - calorie intake, with higher or lower amounts depending on the calorie level.
- Choose a variety of fruits and vegetables each day. In particular, select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.
- Consume 3 or more ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products. In general, at least half the grains should come from whole grains.
- Consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.
## Physical Activity Assessment Tool

### Subject ID

### About how many steps do you take in an average day?

<table>
<thead>
<tr>
<th>Steps</th>
<th>Usually / Often</th>
<th>Sometimes</th>
<th>Rarely / Never</th>
<th>Does Not Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you take the stairs?</td>
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<tr>
<td>How often do you park away from stores when running errands?</td>
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</tr>
<tr>
<td>How often do you park away from work/office?</td>
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<tr>
<td>How often do you pace instead of standing still while waiting or on the phone?</td>
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<tr>
<td>How often do you use the facilities away from the closest one?</td>
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<tr>
<td>How often do you walk with someone and make &quot;moving meetings&quot;?</td>
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<tr>
<td>How often do you change the channel on your TV set without a remote?</td>
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<tr>
<td>How often do you walk around the house during commercials on TV?</td>
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<tr>
<td>How often do you return your shopping cart to the store?</td>
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<tr>
<td>How often do you skip the drive-thru and go into a store?</td>
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<tr>
<td>Other activity not listed?</td>
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</tbody>
</table>

### Moderate Exercise

<table>
<thead>
<tr>
<th>Moderate Exercise</th>
<th>0-60min</th>
<th>61-120min</th>
<th>121-180min</th>
<th>180-239min</th>
<th>240-299min</th>
<th>300min+</th>
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</thead>
<tbody>
<tr>
<td>How much total moderate aerobic exercise in an average week?</td>
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<tr>
<td>Hiking, brisk walking?</td>
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<tr>
<td>Light gardening / yard work?</td>
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<tr>
<td>Dancing?</td>
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<tr>
<td>Golf (walking and carrying clubs)?</td>
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<tr>
<td>Bicycling (less than 10mph)?</td>
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<tr>
<td>Leisure swimming?</td>
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<td>Exercise classes, such as Tai Chi?</td>
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<td>Elliptical or treamilling?</td>
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<tr>
<td>Other activity not listed?</td>
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</table>

### Vigorous Exercise

<table>
<thead>
<tr>
<th>Vigorous Exercise</th>
<th>0-60min</th>
<th>61-120min</th>
<th>121-180min</th>
<th>180-239min</th>
<th>240-299min</th>
<th>300min+</th>
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<tbody>
<tr>
<td>How much total vigorous aerobic exercise in an average week?</td>
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<tr>
<td>Running or Jogging (above 5mph)?</td>
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<tr>
<td>Swimming laps?</td>
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<td>Exercise class, such as aerobics or spinning?</td>
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<td>Heavy yard work?</td>
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<tr>
<td>Basketball or similar sport?</td>
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<tr>
<td>Other activity not listed?</td>
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</tbody>
</table>

### Strength

<table>
<thead>
<tr>
<th>Strength</th>
<th>0-60min</th>
<th>61-120min</th>
<th>121-180min</th>
<th>180-239min</th>
<th>240-299min</th>
<th>300min+</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much total strength training exercise in an average week?</td>
<td></td>
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<tr>
<td>Weight lifting (heavy weights, low rep)?</td>
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<tr>
<td>Weight lifting (light weights, high rep)?</td>
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<tr>
<td>Weight lift with dumbbells?</td>
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<tr>
<td>Weight lift with resistance bands or nautilus?</td>
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<tr>
<td>Stretching?</td>
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<tr>
<td>Pilates / Yoga?</td>
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<tr>
<td>Other activity not listed?</td>
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</tbody>
</table>

### Dietary Habits

<table>
<thead>
<tr>
<th>Dietary Habits</th>
<th>Usually / Often</th>
<th>Sometimes</th>
<th>Rarely / Never</th>
<th>Does Not Apply</th>
</tr>
</thead>
<tbody>
<tr>
<td>How often do you follow the Food Guide Pyramid in a week?</td>
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<tr>
<td>How often do you eat at least 2 cups of fruit in a day?</td>
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<tr>
<td>How often do you eat at least 2 cups of vegetables in a day?</td>
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<tr>
<td>How often do you eat a variety of colors of fruits and vegetables in a day?</td>
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<tr>
<td>How often do you eat 3 or more ounce equivalents of whole grains in a day?</td>
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<tr>
<td>How often do you eat 3 cups of fat-free or low-fat dairy products in a day?</td>
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</tbody>
</table>