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The Effectiveness of Exercise and Nutritional Counseling on Decreasing Body Composition and Increasing Fitness Levels in Firefighters

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Abstract

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Dissertation Submitted in Partial Fulfillment

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Abstract

Cardiovascular disease is the leading cause of death in the United States; firefighters are at a greater risk for both the disease and death. Their exposure to stress, toxic fumes and smoke, unhealthy eating habits, excessive weight, and low levels of physical activity are all contributing risk factors to this disease. The purpose of this quantitative study was to determine the effectiveness of a multi-faceted program of exercise and nutritional counseling to decrease body fat composition and increase fitness levels nine months after initial implementation among a sample of 202 firefighters. Social learning theory was the theoretical foundation for the study, as the firefighting population utilizes strong social networks which aid in the ability to observe, model, and imitate new learned healthier behaviors. Statistical analysis showed no significant difference between pre- and post-body composition. There were significant differences seen between pretest- and posttest fitness scores. The implication for positive social change lies in the fact that these study findings indicate that voluntary exercise and nutrition programs may not be adequate to address the issue of obesity among the firefighter population. Results can be used to inform better nutrition and exercise interventions for firefighters, thus helping them attain their goal of becoming a healthier workforce.

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Dedication

I dedicate my dissertation to my family, for all the support and encouragement they have given me throughout this whole process. I want to give special thanks to my husband, my children, and parents. To my husband, Charles McNear, for keeping me company during those long nights; my children for knowing when it was time for me to study; and my parents, George and Sylvia Royal, for all their continual support. Special thanks also to my mother-in-law, Lil Shaw for all the support you have provided.

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Chapter 1: Introduction to the Study

Background of the Study

Cardiovascular disease is the leading cause of death in the United States (Byczek, Walton, Conrad, Reichelt, & Samo, 2004). Firefighters are one occupational group in the United States at a greater risk for cardiovascular disease (Kales, Soteriades, Christophi, & Christiani, 2007). The emergency nature of their job, their exposure to toxic fumes, and their personal individual health risks all contribute to their increased risk for cardiovascular disease.

Some of the cardiovascular disease risks that are modifiable are high cholesterol, high triglycerides, high blood pressure, over weight, and obesity (AHA, 2008). Some nonmodifiable cardiovascular risks are age, gender, and familiar genetic history (AHA, 2008). The modifiable and nonmodifiable cardiovascular risks are seen in the general populations and are not specific to just the firefighter population (Byczek et al., 2004). The prevalence of cardiovascular disease in the general population is 37.8% in Caucasian males, 33.3% in Caucasian females, 45.9% in both African American males and females, 26.1% in Hispanic males, and 32.5% in Hispanic females (AHA, 2009). African Americans have a higher prevalence for the risks associated with cardiovascular disease such as hypertension and obesity (AHA, 2009).

As the general population is being adversely affected by cardiovascular disease, firefighters are also being affected by this disease. In an analysis conducted by Kales, Soteriades, Christophi, and Christiani (2007), it was determined that 45% of on-duty deaths in firefighters occurred as a result of heart attacks. In 2007, the United States Fire

Administration (USFA) released firefighter fatality statistics and 118 deaths were reported (USFA, 2007). Out of the 118 deaths, 52 (44.1%) were caused by on-duty heart attacks (USFA, 2007). This fatality data can help direct focus on modifiable risk factors through diet and exercise, factors which may have been previously neglected when firefighters entered into the profession. These factors could guide worksite programs addressing better health.

Even though initial high performance physical fitness levels are needed to enter the firefighting profession, maintaining these levels is not required by many departments (Byczek et al., 2004). The nature of a firefighter's job is based on episodic emergency calls that need strength and endurance to put out a fire in full gear, which weighs 70 lbs (Bycezk et al., 2004). In between these emergency calls, poor eating habits, coupled with no physical activity, can increase their risks for cardiovascular disease and finally an avoidable death by heart attack (Rosenstock & Olsen, 2007). Due to the down times in between calls, many firefighters eat poorly and do not exercise, and subsequently tend to adopt poor health behaviors and weight gains. The prevalence of obesity within the firefighter population is 39% which is more than double the Healthy People 2010 obesity target of being less than 15% for adults (NCHS, 2008). Bycezk et al. (2004) found that the obesity rates in the firefighter population were doubled compared to that found in the general population.

Regular exercise is associated with healthier, longer life, and decreased risk of heart disease, high blood pressure, and obesity (Community Guide, 2004). The Task Force on Community Preventive Services has determined that multi-component

intervention programs, focusing on nutrition and exercise to control overweight and obesity in work site settings, are deemed more effective than a single component program focusing just on exercise and or nutrition alone (CDC, 2005). The two ways of increasing physical activity by influencing behavioral change are through informational and environmental approaches (Kahn et al., 2002). The informational approach is providing information necessary to motivate and empower people to change their behavior from no activity to becoming active and maintaining it over time (Kahn et al., 2002). This information will increase awareness of risks that is associated with inactivity and what is needed to become active. Many individuals do not know where to start regarding exercise; this knowledge will guide their nutritional choices by teaching them about proper food choices that would aid in reduction of weight.

The environmental approach is designed to provide environmental opportunities to develop healthier behaviors (Kahn et al., 2002). To increase physical activity, a safe environment that supports physical activity, whether its outdoor activities or access to recreational facilities, is needed to help develop these healthier behaviors (Kahn et al., 2002). Soteriades et al. (2005) found that, over a five-year period, normal weight gain for firefighters was 1.1 pounds per year of active duty, whereas obese firefighters (BMI > or = 35) gained 1.9 pounds per year and had a higher prevalence of hypertension and elevated cholesterol. These figures are similar to the weight gain and cholesterol levels in the general population; nevertheless, they put firefighters at a greater risk of heart attacks due to their occupation. Soteriades et al. (2005) determined that periodic medical

evaluations, coupled with exercise and dietary guidelines, were needed to reduce the factors which threaten firefighters' health and ensure public safety.

Pioneer exercise programs geared towards firefighters, such as those seen in California, Virginia, and Texas, have evaluated their existing department needs to promote a worksite exercise program. Exercise equipment, place of training, and exercise schedules have been set up by the departments to stress the three areas of fitness (Kahn et al., 2002; Moulson-Litchfield & Freedson, 1986). The three areas of fitness are cardiovascular training, strength training, and flexibility (Moulson-Litchfield & Freedson, 1986). Fitness equipment is available at all fire stations and time allots for workouts, called *protected time*. Through surveillance, a reduction was found in risk factors associated with obesity, along with blood cholesterol levels on average by 0.5mg/dl and an increase in fitness scores by 8% over a 5 year period (Moulson-Litchfield & Freedson, 1986).

Statement of the Problem

Heart disease is the leading cause of on-duty deaths of firefighters. One of the major risk factors for cardiovascular disease is obesity/ overweight. There is a high prevalence of overweight/obesity among firefighters, which increases significantly over the career span (Davis et al., 2002; Soteriades et al., 2005). Being overweight and obese is associated with increased risk for coronary heart disease, hypertension, diabetes, arthritis, and certain forms of cancer (CDC, 2005). Studies have not been done to compare the fitness levels of those fire fighters belonging to jurisdictions which do not require exercise as a job function during their tour of duty. Even though the job itself

requires some exercise, exercise outside of job duties requires proper conditioning to reduce workplace injuries and increase productivity.

The lack of exercise is a major problem for the safety of both the firefighter and public as the ability to perform his or her job becomes impaired.

Purpose of the Study

The purpose of this study was to examine the change in fitness levels and body composition in DC firefighters with their access to a protected time for exercise and nutritional counseling program. Many studies support the greatest success in intervention programs by increasing energy expenditure through exercise and other daily activities, energy intake reduction, nutrition education, lifestyle changes, environmental changes, and psychological support (Naghii, 2006). By examining the relationship of this program to fitness levels and body composition, this study may help further the argument to establish a protected time for firefighters to engage in such programs to reverse the overweight and cardiovascular disease trend in this population.

Nature of the Study

This study was a quantitative study analyzing archival data. The data were obtained from individual medical charts which were coded to maintain confidentiality. All participants had data from their fitness assessment, blood pressure, height, weight, body composition, flexibility, and step test, which was a part of their wellness program. Their personalized exercise prescription was included in their record. The analysis included the initial assessment and the 9-month follow-up assessment. Further explanation of procedures and data will be described fully in chapter 3. My hypothesis

was that the implementation of a physical activity and nutrition program would help reduce body composition and increase fitness levels within DC department firefighters.

Theoretical Framework

The data from the programs were viewed through the lens of social learning theory (SLT). SLT is a behavioral learning theory which defines a behavioral determinant and the process by which individuals adapt another behavior (Bartholomew, Parcel, Kok, & Gottlieb, 2006). SLT states that people learn from one another by observation, modeling, and imitation (Bandura, 1986). The three modes of learning are all affected by self efficacy, expected outcomes, behavior of others, and the environment (Bartholomew et al., 2006). The behavioral capability lies in knowing what to change, having the self efficacy to change it, and knowing what incentives are present to welcome this change. For modeling to take place, one has to observe the behavior, learn how to produce this behavior, and watch the consequences or benefits of performing this behavior. If a subject sees the advantage in performing this behavior, the behavior will be imitated. The key factor affecting modeling is self efficacy. If a person does not believe that he or she has the capability to imitate and model the behavior, then behavior change will likely not occur. Self efficacy can be bolstered by providing training opportunities and clear instructions to perform the modeled behavior (Bartholomew et al., 2006; Berkman, 1995).

The environment also plays a large role in SLT. The physical and social environment help shape behavioral responses of individuals. The social environment in this study is that of colleagues, other firefighters. Strong social environments and

networks are related to the health of individuals within this same network (Berkman, 1995). For this network to be health promoting, this social network must provide a sense of self efficacy and competency to perform the new behavior (Berkman, 1995). The physical environment in this study was the foods available, exercise equipment, and the designated location to exercise. As more individuals within this network begin using exercise equipment and or eating healthy foods, it was believed that others would begin to observe, adopt, and maintain the new behavior. Elliot et al. (2004) discovered that through the SLT, many firefighters changed eating and exercise behavior through a supportive and modeling environment. In this study, I used SLT in a similar way, to guide my analysis on the role of modeling in the changed fitness and body composition among the firefighters.

Research Questions and Hypotheses

Two research questions were asked in this study:

RQ1. Will the exercise and nutritional counseling program decrease body composition in DC firefighters nine months after initial implementation?

$H_0$1. After implementation of an exercise and nutritional counseling program there would be no statistically significant difference in body composition as measured by the skin fold caliper in DC firefighters nine months later.

H_A1. After implementation of an exercise and nutritional counseling program, there would be a statistically significant reduction in body composition as measured by the skin fold caliper in DC firefighters nine months later.

RQ2. Will an exercise and nutritional counseling program increase fitness levels in DC firefighters nine months after initial implementation?

$H_0$2. After implementation of an exercise and nutritional counseling program there would be no statistically significant difference in fitness levels in DC firefighters as measured by the sub maximal 3-minute step test nine months later.

H_A2. After implementation of an exercise and nutritional counseling program, there would be a statistically significant increase in fitness levels as measured by the sub maximal 3-minute step test in DC firefighters nine months later.

The independent variables were exercise and nutritional counseling programs. The dependent variables were body composition and fitness levels.

Operational Definitions

Beta blocker: defined as a blood pressure medication that is used to slow the heart rate and reduces the force of the heart contraction (Nieman, 2003, p 387.)

Body composition: defined as body fat percentage and weight. The body fat is assessed by the use of a skin fold caliper (Naghii, 2006). The measurements are then taken and entered into an equation, the results of which are accurate within (+/-) 4%. The seven-site formula skin fold equation for men is bone density = 1.112-0.00043499(sum of seven skin folds) + 0.00000055 (sum of seven skin folds)²-0.00028826(age) (ACSM, 2006). The seven-site formula skin fold equation for women is bone density = 1.097-0.00046971(sum of seven skin folds)+0.00000056 (sum of seven skin folds)²-0.00012828(age) (ACSM, 2006). This is more accurate than using body mass index (BMI) as a body fat indicator, as BMI does not take into account muscular and ethnic

differences, thus rendering unusually high numbers and potentially placing the participant erroneously in the obese/overweight category (Naghii, 2006).

Body mass index (BMI): a measure used to assess weight as it relates to height. The general definition is body weight in kg divided by height in meters squared (ACSM, 2006, p 58.). Individuals who have a BMI of 25-29 are considered overweight, those with a BMI of 30-35 are obese, and those with a BMI of 35+ are considered morbidly obese (ACSM, 2006, p 58.).

Fitness levels: defined as the ability to complete a sub maximal 3-minute step test based on acceptable ranges. These ranges will be no more than 148 for males and 172 for females (USACHPPM, n.d.). The 3-minute step test is used to determine cardiovascular fitness in which the heart rate in the recovery period is assessed after 3 minutes of stepping up and down on a 12 inch bench/step (UACHPPM,nd). The 3-minute step test is most appropriate in mass screening environments (Santo, 2003; Watkins, 1984). This sub maximal test is very reliable and valid as long as the post test heart rate is taken accurately (Watkins, 1984). Watkins (1984) reported greatest reliability of this test as long as the recovery heart rate is taken within the first 20 seconds post test while standing (r=0.94) (Santo, 2003).

Protected time: defined as time that is used while on duty to exercise.

Research Methodology

The study used a quantitative design to identify any differences in the measurements pre- and post- program intervention. The target population was District of Columbia (DC) Firefighters. They are composed of both males and females, ranging in

age from 18-62. The sampling frame was 7 Battalions encompassing all 4 (24hr) shifts. Individuals from one Battalion all 4 shifts with pre- and post-data were pulled from the data set, thus comprising a convenience sample.

The archival data that were analyzed were sent via electronic format without any personal identifying information such as participants' names. Participants were assigned codes to maintain confidentiality. The variables that were included are age, gender, pre- and post- intervention resting blood pressure, pre- and post-intervention resting pulse, pre- and post- intervention fitness measurements, and pre- and post-intervention body fat percentage. Blood pressure medication use was also disclosed. A beta blocker is a blood pressure medication used to slow heart rate and reduces the force of the heart contraction (Nieman, 2003, p 387.).Those taking beta blockers were excluded from the sample, as this drug prevents the heart rate from increasing with physical activity, and thus affects the objectivity of the fitness assessment. A more detailed description of the data being used and any excluded will be discussed further in chapter 3.

A repeated measure analysis was used to examine if pre- and post- program results showed any differences in body composition and fitness levels after controlling for potential confounders. More detail will be given in chapter 3.

Assumptions, Limitations, and Delimitations

The instrumentation used in this study could be a limitation. Because the medical metrics used for this study were collected by different nurses, there may be variance in those scores due to poor inter-nurse reliability. For example, the skin caliper test for body fat, if done incorrectly, can yield incorrect numbers. Each person may grab the various

skin folds differently than others if he or she is not trained properly to take these measurements. Also, if the wrong size blood pressure cuffs are used, an abnormally low or high blood pressure may be obtained. No safeguards were in place to exclude this possibility. Additional limitations stemmed from the lack of data on compliance to the personalized exercise program, the unmeasured (but certainly significant) effects of maturation on the post program scores, and the lack of assessments on firefighter stress. Stress has been noted as a contributing risk for cardiac arrest in many coronary event survivors (Dittmar, 2006). The occupational stressors of firefighting place these individuals who are at high risk for cardiovascular disease at a greater incidence of experiencing a cardiac event. Due to this effect, it is recommended to employ interventions to reduce the risk for cardiovascular disease thus reducing the likelihood of work related stress to increase the risk for a coronary event (Davis, Jankovitz, & Rein, 2002). In this study, stress was not being measured but would be an area to develop further research to examine stress reduction in addition to increase physical activity.

The assumptions for this study were that all participants attended the nutritional counseling program and did not participate in any other exercise or nutritional programs.

The delimitation of this study is that these results are representative of an urban fire department comprised largely of African Americans. The results may not be generalized to a fire department in a less urban area and with a different ethnic and age population make-up.

Significance of the Study

The findings from this study could influence public policy. In Washington, DC the administrative offices of the District of Columbia Fire and Emergency Medical Services are not in full support of allowing fire fighters to have protected time to participate in physical activity due to the pressures that reside on the fire department. With other surrounding jurisdictions, such as Alexandra Virginia, protected time was used to allow their firefighters to exercise. The findings from this study may give firefighters the knowledge and support to help encourage them to exercise when they can in between fire calls. This study can also help support the argument for the necessity to enforce protected time to achieve optimal fitness levels, which, in turn, could help reduce overweight fire fighters and increase their overall conditioning.

Conclusion

The issue of overweight and obesity is adversely affecting American firefighters. The lack of physical activity between their emergency calls, and poor nutritional habits, can increase their risk for being overweight, obese, and cardiovascular disease. This study analyzed the effectiveness of a multifaceted program in the reduction of body composition and to increase fitness levels in this population. The implication for positive social change is the ability for the DC fire department to initiate a policy change, based on the results of this study, to allow protected time to be used for exercise to help control the weight gain seen in firefighters. This policy change will protect the firefighters as well as increase public safety. Firefighters with increased physical conditioning will be

able to perform their job at an optimal state. This increased physical conditioning would also help decrease the risk factors for cardiovascular disease.

In this chapter, I reviewed the pertinent background information on the overweight issues, cardiovascular disease, and its implications for firefighters. In the next chapter, I review the role of various programs in exercise and nutrition within this population, and the ways in which similar structured populations have worked to address this issue. The theoretical framework of this study is also discussed in this chapter. In chapter 3, I discuss and justify the quantitative design to address my research questions and hypotheses, along with the sample size used, the data collected, and type of data analysis performed. The ethical considerations of the study are also disclosed in this chapter. In chapter 4, I discuss data analysis; in chapter 5, I discuss further implications for social change, and present a call to action and implications for further studies.

Chapter 2: Literature Review

Cardiovascular disease is the leading cause of on-duty deaths of fire fighters in the United States (Soteriades et al., 2005). The episodic nature of their job, unhealthy eating habits, familiar/genetic histories, excessive weight, and low levels of physical activity are all contributing risk factors for cardiovascular disease (Bycezk et al., 2004). The purpose of this study was to determine the effectiveness of a multi-faceted program of exercise and nutritional counseling to decrease body composition and increase fitness levels among firefighters of the District of Columbia (DC) Fire department. This literature review establishes the need for continued study to determine the best interventions needed to reduce this risk in firefighters. Even though firefighters have to pass a physical fitness test to enter the department, many departments do not continue to assess their firefighters for annual physical conditioning (Davis et al., 2002). In addition, many fire departments do not offer nutritional and exercise programs to help reduce these risk factors (Soteriades et al., 2005).

The search strategy used for this literature review was to search multiple databases including EBSCO, ProQuest, PUBMED, Academic Premier, and ERIC for peer reviewed scholarly articles. Books providing some theoretical basis for measurement on exercise prescription and testing were obtained from the University of Nevada- Las Vegas. The key words used for this search were *firefighter*, *conditioning*, *exercise*, *cardiac risk factor*, *nutritional counseling*, and *cardiovascular disease*. The publication years included in this search are 1984- 2009. References used in 1984 were consistently

cited in more recent references as a continuation of the previous study and served as the foundation of many studies seen in the more recent years.

This chapter provides a review of traditional fitness programs and nutritional programs in both groups and individuals in the firefighter and police populations. In addition, a more detailed discussion of the social learning theory and its relationship to the proposed research questions is analyzed. This chapter includes a discussion of results that differ based on voluntary and mandatory participation.

The literature review results are grouped in two categories: fitness programs and intervention programs. Fitness programs are those that took the approach solely focused on exercise and reduction of body weight and increasing physical activity levels. The intervention programming approach focuses on not only reducing body weight and increasing physical activity, but also on the nutritional counseling and the behavioral components needed to sustain and keep the change. The intervention programming also focuses on the behavioral component of sustainability to maintain the adapted behavior to continue to decrease the risk of cardiovascular disease over time.

Fitness Programs

In a 16-week training program, Roberts, O'Dea, Boyce, and Mannix (2002) studied the fitness levels of firefighter recruits. The initial pre-intervention measurements of a sample of 115 recruits showed that the entire group was not cardiovascularly fit to perform essential firefighting duties. A one hour, 3 times a week fitness program that focused on cardio, muscular strength, and flexibility was implemented for 16 weeks. This program did significantly increase fitness levels by 28% and decreased fat weight from

14.6 ± 8.0 to 13.0 ± 7.1 kg and increased lean muscle mass from 68.8 ± 9.9 to 69.9 ± 9.5 kg.

In addition to cardiovascular disease risks, increased weight and fat percentages can also predict job performance. Williford and Scharf-Olson (1998) wanted to evaluate the job performance of 100 firefighters in their ability to stair climb, hose hoisting, forcible entry, hose advance, and victim rescue and their body percent versus lean body mass. There was a statistically significant relationship between body fat percentage and the time to perform job tasks. Those with less body fat took less time to complete their tasks. Positive relationships between better cardiovascular fitness and muscle strength were predictors of task performance.

Fitness programs that have worked to reduce fat and increase physical activity have been enhanced to include the offering of nutritional counseling. Cady, Thomas, and Karwasky (1985) added nutritional counseling to their exercise program for the Los Angeles County fire department. After initial assessment, nutritional counseling and exercise prescriptions were given to each firefighter. This was a longitudinal study starting in 1970 through 1983 with a sample size of 1725. These programs were personalized, as each member had unique characteristics to consider. The fitness program was successful in detecting unknown diseases as a result of the medical examination. Twenty-two percent of the firefighters were found to have hypertension or borderline hypertension, as well as other musculoskeletal problems such as back and knee. After completion of the 14-year program, an increase in physical activity by 16% was seen as well as healthier eating habits and a reduction in fat percentages.

Because fire suppression is taxing on the body, it is essential that firefighters have good upper body muscular strength and aerobic/endurance to perform the tasks (Rhea, Alvar & Gray, 2004). Rhea et al. (2004) studied a sample of 20 firefighters to examine the correlations between fitness tests and job performance tests. Job performance tasks are hose pull, victim drag, equipment hoist and stair climbing which are tasks completed in a given time. Rhea et al. found job performance to be significantly correlated to muscular strength, muscular endurance, and anaerobic endurance. The emphasis of their research was to change focus of firefighter programs from just cardiovascular fitness to more of physical conditioning program focusing on all 3 fitness components. The 3 fitness components are frequency, intensity, and duration of the activity (ACSM, 2006).

Frequency details how many days of the week exercise should be performed. The American College of Sports Medicine (ACSM) recommends exercise 3 to 5 days per week to increase cardiovascular fitness (ACSM, 2006). To improve cardiovascular fitness, intensity at low to moderate levels is needed. Nieman (2003) recommended that low to moderate intensity exercise prescription will decrease cardiovascular risks, increase fitness, and aid in adherence/compliance of the exercise program. Duration details how long the exercise routine should be to achieve optimal goals. The CDC and ACSM recommend that moderate level intensity exercise for 30 minutes most days is essential in reducing cardiovascular risks and increase fitness levels (Nieman, 2003). The Promoting Healthy Lifestyles Alternative Models Effects (PHLAME) program used this recommendation of at least 30 minutes of moderate exercise to produce favorable fitness levels among a prospective sample of 599 firefighters (Elliott et al., 2007). There was

significantly less weight gain seen in both group-taught and individual counseling session interventions in the exercise component of the program (Elliott et al., 2004; Elliott et al., 2007).

To test the cardiovascular fitness and body composition in the firefighter population, many studies have employed the 3-minute step test more commonly known as the YMCA step test and body fat analysis (Byczek et al., 2004; Henderson, Berry & Matic, 2007). The descriptions which follow describe the analyses of the intervention.

Body mass index (BMI) is a measure used to assess weight as it relates to height. The general definition is body weight in kg divided by height in meters squared (ACSM, 2006, p 58.). Individuals who have a BMI of 25-29 are considered overweight, those with a BMI of 30-35 are obese, and those with a BMI of 35+ are considered morbidly obese (ACSM, 2006, p 58). Despite the general usage of BMI calculations in clinical settings, BMI has a large standard of error and other measurements to measure body composition should be used (Lothran, Houtkooper, & Going, 1997). When addressing various body types such as those with large muscular composition, BMI is contraindicated. Soteriades et al. (2005) studied 332 firefighters over a 5 year period and found that mean BMI increased from 29 at time 1 to 30 at the follow-up exam. Soteriades et al. noted that BMI can overestimate overweight among muscular firefighters versus using a body fat percentage measure such as skin fold and or hydrostatic weighing.

Hydrostatic weighing is a technique to measure body composition by submerging the participant under water. This technique measures body volume as it relates to the amount of water displaced due to the weight of the body. This technique is most accurate,

although expensive and impractical for mass screening purposes such as multiple firehouse workplace settings. Green and Crouse (1991) used hydrostatic weighing with a small sample size of 24 firefighters measuring body composition for 5 years. There was a significant decrease in mean fat percentage of 1.43% across 5 years with the greatest difference of 2.48% occurring after year one of the mandated exercise program (Green & Crouse, 1991). Davis, Jankowitz, and Rein (2002) also used hydrostatic weighing in combination with skin fold measurements. A sample of 71 firefighters from 1983-1996 were studied to determine how body fat percentage changed with age. A significant increase of body fat was found as it related to age by 0.3% per year on average. These findings suggest that skin fold measurements may be an effective approach to weight loss measurement. Indeed, due to the cost effectiveness of administering such a test in a large setting, skin fold measurements have been suggested as the best approach in a workplace setting (Moulson-Litchfield & Freedson, 1986). Many participants are not willing to be submerged under water for the purpose of body composition measurements which is done in the hydrostatic weighing method.

Skin fold measurements through the use of calipers is a widely used, less expensive, and more convenient method to assess body fat. The calipers are used to measure subcutaneous fat at the various test sites on the body (McArdle, Katch, & Katch, 2001, p. 772). Due to the ease of this body fat measurement tool, many researchers have found participants to be more at ease to participate in getting their fat percentages assessed (Garver, Jankowitz, & Danks, 2005). Roberts et al. (2002) studied 115 firefighter recruits in a 16-week supervised exercise training program. To assess body fat

measurements in this program, Roberts et al. (2002) utilized a seven site skin fold caliper measurement. Roberts et al. (2002) reported using the Lange apparatus with the test-retest reliability coefficient of $r = 0.85$. Roberts et al. (2002) took all skin fold measurements on the right side of the body with duplicate measurements taken at each site. Retests were taken if a duplicate measurement was not within 1-2 mm of the first measure. The 16-week training program of the firefighter recruits did increase fitness levels by 28% and decrease fat mass by 14.6 ± 8.0 to 13.0 ± 7.1 kg.

Another assessment tool is the submaximal test, 3-minute step test such as the YMCA step test. The step test is used to determine fitness levels by measuring the heart's recovery response to stepping at a fixed stair height therefore examining post exercise heart rates (Armstrong et al., 2006). This test is most suitable for mass testing and participants should be properly educated on how the test is performed (Watkins, 1984). The 3-minute step test entails stepping on a bench to the beat of a metronome that is set for 96 beats per minute (bpm) (Nieman, 2003, p. 92-93). After the completion of the 3-minute step test, a standing pulse is taken for 15 seconds. Santo (2002) administered a 3-minute step test to 60 participants to measure maximal oxygen consumption (VO_{2max}) and heart beat counts at 15 s and 1 mm. Santo found significant correlations between VO_{2max} and 15s and 1mm heart beat counts. A high recovery heart rate will dictate a low fitness level (Pollock & Wilmore, 1990, p. 276).

In reviewing the literature, there is a mixture of tests used to determine fitness levels with firefighters. Studies using small sample sizes have used Bruce protocol treadmill tests and cycle ergometers (Green & Crouse, 1991; Roberts et al., 2002). Green

and Crouse (1991) used the Bruce protocol treadmill tests to 24 firefighters to determine their maximal oxygen consumption, VO_{2max}. This treadmill test consisted of placing 12-lead electrocardiogram to measure heart rates during the test, and the firefighter ran on the treadmill for each graded 3 minute stage till maximal muscle fatigue or 80-100% VO_{2max}. VO_{2max} was also estimated for the entire total time each firefighter was on the treadmill. This study was conducted annually for 5 years to determine the progress and success of the prescribed exercise programs. There was a significant difference in VO_{2max} across 5 years with the greatest improvements seen in 1st year with a mean of 40.69 ml O_2 kg or 11.63 METS.

With cycle ergometers, Roberts et al. (2002) tested rookies in firefighting recruitment classes for over 4 years for a total of 115 recruits. After a 2-3 minute warm up and attaching a heart rate monitor to each participant, the participant used an upright posture with 5 degree knee bend at leg extension. Roberts et al. used 3- 3 minute staged protocol starting the first stage at 150 $kg \cdot min^{-1}$. Each stage would progress higher in the attempt to increase the steady state heart rate. Blood pressure was measured manually to monitor both hypotensive and hypertensive responses to the testing in each stage. Roberts et al., (2002) terminated the tests when the subjects reached 85% of their age-predicated maximum heart rates. After the institution of a 16-week mandatory exercise training program, these recruits aerobic capacity increased by 28% percent.

Pynes (2001) and Henderson, Berry, and Matic (2007) used the step test in a mass testing setting to measure fitness levels in the firefighter population. Financial constraints as well as willingness to participate in the program will dictate also which

fitness test is best suited for this work environment. Using a less invasive and easily administered fitness testing program will ensure lower subject mortality (drop-out rates) in the program.

As researchers are studying the fitness levels of firefighters, they are faced with determining the appropriate methodology for answering the research questions and selecting their sample size based on this population. This population operates on peer to peer influences and social networking which will further be discussed below. Roberts et al. (2002) used a convenience sample of 115 firefighter recruits to study the fitness levels before and after a 16-week training program. The pre-intervention evaluation showed that the entire group of firefighters was not cardiovascularly fit to perform routine firefighting duties (Roberts et al., 2002).

Garver et al. (2005) used a similar approach in using a convenience sample like Roberts et al. (2002) but with one variation of using 2 comparison groups instead of one. Garver et al. used the convenience sample by selecting 17 industrial firefighters and 51 municipal firefighters to undergo medical evaluations and fitness testing. Both groups showed no significant differences in fitness testing. The industrial firefighters had significantly higher grip strength and significantly lower total blood cholesterol levels than municipal firefighters.

Green and Crouse (1991) also used a convenience sample however in a longitudinal study, over a 5 year period, to determine the effects of a mandated fitness program on firefighters. There was a significant decrease in mean fat percentage of

1.43% across the 5 years with the greatest difference of 2.48% after the 1st year of the mandated program (Green & Crouse, 1991).

In addition to using convenience samples, archival data have been used to determine the health and focus areas of intervention needs for firefighters. Kales, Soteriades, Christophi and Christianti (2007) examined archival data of on duty deaths of US firefighters from 1994 to 2004. These researchers examined specifically deaths that were due to coronary heart diseases. Four hundred and forty-nine deaths were attributed to coronary heart disease 39%, 32% during fire suppression, 31% during alarm response/return and 37% during other activities (Kales et al., 2007). Kales et al. (2007) believed the firefighters risk of coronary heart disease during fire suppression increased because of the cardiovascular demand of the job, the lack of physical fitness, poor nutritional habits, and underlying cardiovascular risk factors.

As these different methodologies are used to answer the various research questions of the previous researchers, this study was focused on archival pre-post data. This methodology is similar to Roberts et al. (2002) and Kales et al. (2007). The archival data detailed pre-post data to be able to examine the effectiveness of the nutrition and fitness programs that was given to the convenience sample population. As Kales et al. (2007) studied archival data to analyze trends and gave recommendations on how to address these trends; this study looked to examine the archival data and give recommendations as to next steps. A review of different methodologies of research aided in choosing the appropriate methods for this study. The method chosen was based on the research question as well as the population being examined.

Intervention Programs

In addition to taking the measurements as described in fitness programs, the intervention program to be implemented must be effective in changing health risks. Promoting healthy lifestyles Alternative Models' Effects (PHLAME) in the study by Moe et al. (2002) used a team and one-on-one approach to change health behaviors in 600 participating firefighters. Moe et al. (2002) provided nutritional counseling and exercise testing and prescription in a two mode approach. The researchers were able to elicit weight loss and improved eating habits by both modes of delivery. Cady et al. (1985) also used a group nutritional education approach with individualized exercise testing with prescription. Cady et al. (1985) improved physical fitness of the 1725 firefighter participants by 16% with this approach. Supportive exercise counseling on type, duration and mode of exercises has been determined to be most successful in compliance and success in weight loss (Byczek et al., 2004; Cady et al., 1985). The data used in this study was derived from a program that shares its foundation with the PHLAME study. This program used a group nutritional aspect with a one-on-one approach for the exercise testing and prescription segments. The group approach helps facilitate greater learning while the one-on-one approach to exercise allows for greater personalization. This personalization is needed as each firefighter will have different fitness needs/requirements and or restrictions due to prior sustained injuries. This type of exercise training will help keep members motivated to participate thus yielding the desired results and maintain these results over time (Roberts et al., 2002).

The theoretical foundation for many of the weight reduction programs referenced here are social learning theory (SLT) and the Transtheoretical Model/Stages of Change (TTM). The PHLAME program utilized both the SLT and TTM. For one-on-one interaction and counseling of exercise and nutrition, TTM was deemed most appropriate to help center the interaction around just the individual (Elliot et al., 2004; Elliott et al., 2007; Moe et al., 2002). This allowed the researcher to perform motivational interviewing to determine which stage the firefighter resided in and the approach needed to motivate them to adopt a healthier behavior (Elliot et al., 2004). For a group setting, SLT was considered the basis for behavioral change. The SLT proposes that experiences along with peer influence affect individual behaviors (Moe et al., 2002). This group approach allows for team building activities which through the PHLAME study found physical activity and nutritional behavior were significant (Elliott et al., 2004; Elliott et al., 2007). The team approach yielded more changes in nutritional habits than the one-on-one approach. The team approach was found to be more effective and more economically feasible for work site health promotion (Elliott et al., 2007). This team approach is also supported largely by the strong social support networks that are formed in this work setting. These firefighters spend large amounts of time together in close quarters and build strong peer bonds and team unity not seen in many other occupations. Berkman (1995) has documented that strong supportive relationships within a social support network is related to the health of the individuals who reside in these networks. If one individual adopts a new behavior, the others in the network will begin to also adopt that same behavior as it will be deemed socially acceptable by this group (Berkman, 1995).

This study uses the social learning theory as the theoretical framework due to the nature of the population. This population utilizes strong social networks which aids in the ability to observe, model, and imitate new learned healthier behaviors.

Another first responder that is very similar to the firefighter population in their social network structure, the police population, has also experienced how diet and exercise can help the group achieve better health behaviors. Pavlou, Krey, and Steffee (1989) and Moore (2006) have found that when officers exercise in conjunction with nutritional counseling, the police officers were able to lose weight and keep the weight off. Those individuals just dieting alone or exercising alone were not able to keep the weight off. Pavlou, Krey, and Steffee (1989) initially ran a pilot study with 24 police officers to determine the effects of exercise and diet of weight loss. Pavlou et al. (1989) were able to show after 6 and 18 month follow up from the initial assessment that significant weight loss was maintained in the groups who had nutritional counseling in conjunction with exercise.

As with the police population, positive effects have been shown with programs focusing on diet and exercise. Shifting the focus from the police population back to the fire population there are studies showing the negative effects of inactivity. Studies by Soteriades et al. (2005) have shown that without increased physical activity, obesity increased over a 5 year period. Soteriades et al. (2005) studied BMI of 332 firefighters over a 5 year period to study weight gain and obesity increased significantly by the 5th year by 39.7% compared to the first year of 34.9%. Soteriades et al. (2005) also found that extreme obesity increased by the 5th year to 2.4%. Davis et al. (2002) and Moulson-

Litchfield and Freedson (1986) both stated that mandated physical fitness programs illicit the necessary weight loss compared to a non-mandatory program. Moulson-Litchfield and Freedson (1986) discovered that voluntary programs are not as effective in weight loss as a mandatory program. Further emphasis, such as allotted time to exercise in a mandated program, showed the needed weight reduction, which in turn reduced the prevalence of cardiovascular disease risk factors (Kales et al., 2003; Moulson-Litchfield & Freedson, 1986; Pynes, 2001).

The aforementioned studies presented here have shown a positive and direct correlation between physical conditioning and a decrease in weight which can ultimately reduce the risk of modifiable on duty fatalities due to cardiovascular disease. Roberts et al. (2002) have shown that firefighters tend to become overweight over a 5 year period since the beginning of employment if no intervention is implemented. While studies have shown a relationship between mandated programs and reduction of cardiovascular disease risks factors, there is little evidence to show a voluntary program will be effective in reducing cardiovascular disease risks through weight reduction. In addition, all the studies found here used a sample population of firefighters that are Caucasian males. Very little data has not been presented on a largely African American population including females where the cardiovascular risk factors are significantly higher than the Caucasian males.

African Americans have a higher prevalence for cardiovascular disease (CVD) and hypertension than do Caucasians (Somers et al., 2002). Somers et al. (2002) and Mensah et al. (2005) have determined that African Americans living in the South Eastern

sections of the US have a higher prevalence and risk for hypertension than those living in other parts of the country. This was found largely due to economic status, education levels and the environment. This same CVD disparity is also seen in the Hispanic population (Mensah et al., 2005). More aggressive prevention and control programs for CVD need to be implemented to change the disparities seen in the African American and Hispanic population.

All studies that have been examined here looked at CVD risks within fire departments. All the samples examined CVD and interventions with Caucasian males and only one study included Caucasian women. This may be largely explained because of the ethnic and gender make-up of those fire departments being studied. In 2007 the US Fire Service reported a total of 304,000 career firefighters, full time (NFPA, 2007). Of those 304,000 firefighters, 16,000 (5.3%) were women; 32,000 (10.5%) were African American and 19,000 (3.6%) were Hispanic (NFPA, 2007). In 2007, the fire department in Washington, DC was comprised of 2,072 fire fighters (NFPA, 2007). Of those 2,072, 949 (45.3%) were Caucasian; 1086 (52.4%) were African American and 29 (1.4%) were Hispanic. The fire fighter population of DC clearly shows that African Americans are the majority which truly reflects the ethnic make-up of the community it serves. In 2007, the total population in Washington, DC was 588,292 (US Census Bureau, 2007). Of this population, African Americans make up 55.2% and Hispanics make up 8.3% (US Census Bureau, 2007).

Even though the evidence presented outlines the increase CVD risks for firefighters as a whole, the risks are an even greater concern among African Americans

who have a higher prevalence for these risks. A greater emphasis in conducting research to determine if a program such as PHLAME will be as successful in a predominately African American population compared to a largely Caucasian population which the program originated is needed. Cultural concerns such as delay in receiving adequate care, institutional racism and gaining provider trust must also be carefully addressed within the African American population as to ensure effective outcomes (Treadwell & Ro, 2003; Williams, 2003). The previous studies done cannot be generalized to all firefighter jurisdictions as ethnicities vary and geographical locations of these departments may also affect the outcomes of programs. As Davis et al. (2002) have detailed that their results cannot be generalized to other fire districts as other variances in the population may not attain the same results as their study.

Just as African Americans are at a greater risk for cardiovascular disease and hypertension so are they for obesity. Based on data from the National Health and Nutrition Examination Survey (NHANES) the prevalence for obesity among African Americans was 45%, 36.8% for Hispanics and 30.6% for Caucasians (Pan et al., 2009). Pan et al. (2009) had proposed that African Americans and Hispanics are less likely to exercise, have difference attitudes/cultural norms of body image and less access to affordable foods and areas to exercise. Access to healthy food choices is a limited resource in some urban areas compared to some wealthier areas which can greatly affect obesity prevalence (Moreland, Diez- Roux, & Wing, 2006). Residents in these urban communities are forced to shop in convenience stores or fast food establishments.

Healthier food choices tend to be more expensive than higher caloric food choices (Moreland, Diez-Roux, & Wing, 2006).

In addition to the lack of appropriate healthy food choices available in the urban communities, parks and areas promoting physical activity are also non-existent. Physical activity is needed to decrease the prevalence of obesity but without the areas in communities that promote physical activity such as walking, parks and or outdoor activities this becomes difficult. Communities with high percentages of African Americans have fewer available parks, public pools, and other places to promote exercise (Powell, Slaters, & Chaloupka, 2004). Kieffer et al. (2006) cited lack of exercise programs, exercise facilities and social support networks prevented many from achieving their goal of weight loss.

Flegal, Carroll, Ogden, and Johnson (2002) determined that individual focused programs emphasizing lifestyle changes including education, reduced fat and energy intake, regular physical activity can produce long term weight loss of 5-10% from their starting weight. Kieffer et al. (2006) determined more policy and individual interventions should be established to help individuals achieve healthy behaviors for weight loss and increase of physical activity.

Since literature is lacking as to the effectiveness of fitness programs with a largely African American fire fighter population, this study is needed to address this gap. Thus, this study looked at the effectiveness of a voluntary intervention in reducing weight thus reducing cardiovascular disease risks which are disproportionately higher in the fire fighter population.

Chapter 3: Research Method

Methodology

After reviewing the literature in chapter 2, a gap in the literature was seen in studies examining largely African American firefighter populations as well as voluntary participation in on-duty exercise/ nutrition programs. In this chapter, I describe in more detail the research design, sample, data collection processes, instrumentation used, data analysis, and ethical considerations. In addition, included in this chapter is the rationale behind why one particular research design was most appropriate for this study.

The purpose of this study was to examine the effectiveness of an exercise and nutrition program on body fat composition and increase in fitness levels in DC firefighters. The sample was comprised of African American, Caucasian and other ethnic firefighters. The research design to examine this effectiveness was through quantitative research methodology. This was a single group pre-post test design using archival data (Dorsten & Hotchkiss, 2005). The archival data were readily available for examination and helped direct focus towards areas of fitness and health (Kales et al., 2007). A convenience sample was also used and has been used by Roberts et al. (2002) and Garver et al. (2005) as this population has strong peer to peer social networking bonds and influences each other as a whole. To use simple random sampling for this population would introduce a potential for external influences that cannot be controlled and therefore using a population from a single battalion was a valid strategy for this research.

There are strengths and limitations with this design. The strength is the sample size which is be discussed further in this chapter; a limitation exists in interpreting a

cause-and-effect relationship, as well as the limited ability to determine if the changes that have occurred were due to the intervention or due to another external unknown factor. The threats to internal validity such as maturation and history could have confounded effects on causal interpretation of results (Singleton & Straits, 2005). Singleton and Straits (2005) defined maturation as the physical changes that can take place with a subject as time passes regardless of the intervention. Any ordinary change a participant would have made to their diet or physical activity naturally as time passed could not be totally attributed to the intervention that was being administered to the participants. This was an exploratory study to identify significant changes in body fat reduction and fitness level increases before and after the intervention.

Setting and Sample

The population that was examined was the District of Columbia Fire department. In 2004, the total population of DC fire fighters was 1,867 (NFPA, 2007). Of the total population, there were 7 Battalions and 33 firehouses that were geographically divided in the city which made up the sampling frame. One battalion can potentially have 5 to 6 firehouses geographically assigned to it. The sample was one of the 7 battalions with pre- and post- body fat and step test measurements for all 264 of its members. This one battalion, making up the sample, was comprised of all firefighters who work in those fire houses of that battalion all 4 shifts, with pre- and post- body fat and step test measurements.

Participants were men and women, 18-62 years of age, working all shifts (1-4) within the chosen battalion during the time period of the calendar year of 2004. The

target population was the District of Columbia Fire department. To be included in the study, the participants had to have both pre- and post- test body fat, pre- and post- test fitness test results and have taken the nutrition class. The participants who did not meet these criteria but were in the battalion were excluded. The sample demographics included an average age of 37, with 95% of the population being male (NFPA, 2007). Race/ethnicity was not an inclusion criterion for the study. Any participant taking blood pressure medications, as reported by the participant, such as beta blockers were excluded from the study/analysis as this would prohibit achieving maximal heart rate. Firefighters with other orthopedic restrictions such as knee and back limitations were also excluded from being selected for this study. These limitations were assessed based on their occupational medical chart which the onsite nurse would have to verify prior to allowing the firefighter to participate in the initial program.

Sample Size

The sample size for this study took into account the battalion size and the power and effect size needed to detect differences. This study utilized a paired *t* test for its statistical analysis due to its design of a single group pre-post test. Roberts et al. (2002), Soteriades et al. (2005) and Rhea et al. (2004) have shown moderate effect sizes all using *t* test and paired *t*-test analysis examining similar variables used in this study. Roberts et al. (2002) set their alpha levels to 0.007 due to the multiple numbers of paired *t* tests that were used which were 7. This study had two outcome variables: body fat percentage and fitness assessment. Due to the 2 variables, there were 2 paired *t* tests used therefore the level of significance would be 0.05 for each analysis. A power of at least .811832, which

is an 80% percent chance of rejecting a null hypothesis, an effect size of .50, the study would require a sample of at least 27 participants which was calculated using the G*Power 3.1 program (Faul, Erdfelder, Lang, & Buchner, 2009). However, due to the nature of this study having a cluster sample (e.g., body fat measures that are likely to be correlated and violate the independent sample assumption of the *t* test), an intracluster correlation coefficient must be determined. In order to detect a true significance, there has to be an increase in the number of clusters versus the number of subjects within a cluster (Killip, Mahfoud, & Pearce, 2004). Based on this intracluster correlation coefficient set at 0.01, a sample size of 185 was needed to detect the significance. This study had 264 participants who were eligible to participate, which is the size of a battalion. The total sample size after adjusting for exclusions was 202. Sixty-two firefighters were excluded due to being on blood pressure medications and medical restrictions.

Intervention

In this study, I examined archival data of how effective the treatment that was administered was on decreasing body fat and increasing fitness levels in DC firefighters. The initial assessment that was administered was a fitness assessment which was comprised of a 3 minute step test, body fat composition, resting blood pressure /pulse screen accompanied with an exercise prescription. Blood pressures were taken using the sphygmomanometer and the head of the stethoscope was placed over the brachial artery to hear the first Korotkoff sound (ACSM, 2006). The Korotkoff sound became the systolic value and the last sound heard became the diastolic value (ACSM, 2006). The

pulse was obtained by palpating the radial artery in the wrist (ACSM, 2006). The exercise prescription was personalized based on each person's pre-test results and the counseling, 30 minutes in length, informed him or her of their focus areas of concern with the emphasis on increasing cardiovascular endurance and muscular strength. Each prescription had the 2 standard areas in cardiovascular training of at least 30 minutes of training and the same muscular strength training exercises. These were standardized due to known weight and treadmill equipment that were available in the firehouses. Each individual was given a how-to guide to exercise (see Appendix A) with the foundation of how often it was recommended they should exercise. The exercises were performed individually and not a part of a protected time activity. Compliance was not measured.

Six months following this initial exercise screening, a group-taught nutritional class was lead by a registered dietitian; the six-month time difference was due to logistical scheduling and timing to test the entire fire department. The class was 45 minutes in length, and an educational booklet developed by the dietitian was distributed to all participants (see Appendix B). Basic instruction regarding dietary habits was focused on, including eating well balanced meals, portion control, caloric intake reduction and increasing physical activity. Box lunches were also provided to each participant including a healthy sandwich, fruit, drink, and baked chips. This lunch was an effort to show the firefighters how to eat healthy lunches. During the instruction, models were provided to show how meal portions should look on the plate and how healthy meals should be prepared. This program followed the same guidelines as the PHLAME study group intervention used by Elliott et al. (2007). The second round of exercise

testing began 3 months after the nutritional classes ended. No compliance was measured as to how well the firefighters followed the recommendations of the dietitian.

Instrumentation

The 3-minute step test also known as the YMCA step test was used to measure post exercise recovery heart rates (ACSM, 2006). Post exercise recovery heart rates decrease with improved fitness levels. The 3-minute step test utilized a 12- inch high step, a metronome set at 96 beats per minute (bpm), and a stop watch to time the 3 minutes and 1 minute recovery period (Nieman, 2003). The test involved stepping up and down on the stair step at the rate of 24 steps per minute for 3 minutes. After the 3 minutes, the participant sat down, and while waiting during the first minute the nurse began to palpate the participants' radial artery (Nieman, 2003). The heart rate was recorded within the first minute of recovery and results were compared against participants' age (ACSM, 2006; Nieman, 2003). Recording the heart rate within the first minute yields a reliability of $r = .94$ (Santo, 2003).

The next value recorded was the body composition which is the body fat measurements recorded as skin fold measurements. The skin fold measurements were recorded through the use of calipers. This procedure was developed in 1930 to measure subcutaneous fat to determine how proportional it is to entire body fat (McArdle, Katch, & Katch, 2001). The skin fold measurements used in this study was the 7 site method where the sites measurements obtained and then placed in the equation to formulate the score were the chest, axillary, triceps, abdomen, suprailiac, thigh, and subscapular region (ACSM, 2006). The measurements were taken 3 times in a row and the best number

(measurements are within 1 to 2 mm) of the three times for each location were taken and plugged into the equation to get the body fat number (ACSM, 2006). The reliability of the 7 site skin fold test is the ability to get consistent and accurate measurements each repetition and $r = .90$ (ACSM, 2006).

Data Collection and Analysis

This study employed a repeated measures research design using a paired *t-test* analysis. The instruments used in this study allow for a quantitative approach. The hypothesis and research questions are listed below to further support the analysis of a pre-post test with the same sample and thus using the paired *t* test for the statistical analysis.

RQ1. Will the exercise and nutritional counseling program decrease body composition in DC firefighters nine months after initial implementation?

H_A1. After implementation of an exercise and nutritional counseling program, there would be a statistically significant reduction in body composition as measured by the skin fold caliper in DC firefighters nine months later.

The data analysis used to test the first hypothesis was a paired *t* test. The paired *t* test compared the mean pre treatment body fat composition measurements to mean post treatment body fat composition measurements to determine if there is a significant difference between the two variable summary scores. The significance level of alpha is set at $p \leq .05$,

RQ2. Will an exercise and nutritional counseling program increase fitness levels in DC firefighters nine months after initial implementation?

H_A2. After implementation of an exercise and nutritional counseling program, there would be a statistically significant increase in fitness levels as measured by the sub maximal 3-minute step test in DC firefighters nine months later.

The data analysis used to test the second hypothesis was a paired *t* test. The paired *t* test compared the mean pre treatment fitness levels to mean post treatment fitness levels to determine if there is a significant difference between the two variable scores. The significance level of alpha is set at $p \leq .05$.

The Statistical Package for Social Sciences (SPSS) version 17.0 was used for data analysis. The data from the spreadsheet received from the liaison were imported into the SPSS program to run the analysis. Participants were assigned a code, thus removing their name and their information was logged in an excel spreadsheet. Their variables such as their pre- and post- program body fat, pre- and post- program step test results, pre- and post- program resting pulse, height, weight, age, sex and ethnicity was also logged in this spreadsheet as well for each coded participant. The variables assigned specific coding were gender and ethnicity/race. For gender, which is a nominal variable, female was assigned to 1; male was assigned to 2. For ethnicity/race, which is a nominal variable, Caucasian was assigned to 1, African American was assigned to 2, Hispanic was assigned to 3, Asian/Pacific Islander was assigned to 4, American Indian was assigned to 5, and Other was assigned to 6. The variables of pre- post- step test measurements and pre- post- body fat measurements are ratio variables. A paired *t* test was used to determine if there are significant differences in mean pre- and post- body fat and fitness assessment scores

of firefighters. Descriptive statistics included mean, standard deviations and frequency which were used to describe gender, age, and race/ethnicity of the sample being studied.

Ethical Considerations

The archival data were from a private source, careful considerations were taken to ensure that all personal information would remain confidential. Due to the use of archival data from a private source in accordance with Walden University IRB regulations, a letter of cooperation and a signed data use agreement was needed to use this data. The data use agreement gave access to the limited data set once all personal identifiers were removed from the Protected Health Information (PHI). This data use agreement was in accordance with all HIPAA requirements. The authorization number 08-02-10-0337244 was given by Walden University IRB to begin the archival data analysis.

The archival data was collected and maintained by the fire department liaison from their electronic medical records of their wellness programs and placed in an Excel spreadsheet. The fire department liaison removed all person identifiers and assigned codes to each individual in the sample. Variables recorded in the spreadsheet were age, ethnicity, height, weight, resting pulse, pre- and post- blood pressure, pre- and post- step test, pre- and post-body fat measurement; these were made available to me for review. The information was sent to me via an encrypted secure e-mail system that was password protected. The password was sent in a separate e-mail. Once that was received then the e-mail file was opened from the secured e-mail system for review and analysis.

The results of this study will be shared with the liaison, who is the infection control nurse of the fire department. The results of this study can potentially help with programming of

their future wellness programs.

Chapter 4: Results

Introduction

The purpose of this study was to examine the effectiveness of an exercise and nutrition counseling program on body fat composition and an increase in fitness levels in DC firefighters. This chapter includes the research findings to answer the research questions and hypothesis discussed in chapter 3.

Descriptive Statistics

The total sample size after adjusting for exclusions was 202. Sixty-two firefighters were excluded due to being on blood pressure medications and medical restrictions. The power calculation was performed in chapter 3. A power of at least .811832 and an effect size of .50 would require a sample of at least 27 participants. Due to this study having a cluster sample, the intra cluster correlation coefficient set at .01, a sample size of 185 was needed to detect significance. The resulting sample size of 202 was large enough to detect significant differences. The demographic variables that were evaluated were age, ethnicity, and gender. The complete demographic data for the sample group are provided in Table 1. Of this group, 94.6 % were male, 5.4 % were female. The mean age was 36.77 years with a standard deviation, SD, of 7.4 years. African Americans made up 66.3% of the population, Caucasians 32.2%, and Hispanics 1.5%. There were no other ethnic populations represented in this sample.

Table 1

Age, Gender, and Ethnicity of Fire Department

Participants (n=202)

Demographic	Percentage	Mean (SD)
Male	94.6	
Female	5.4	
African American	66.3	
Caucasian	32.2	
Hispanic	1.5	
Age (yrs)		36.77 (7.44)

Research Questions & Hypothesis

A paired *t* test was conducted to address the first research question and hypothesis. The first research question asked if the exercise and nutritional counseling program decreased body fat composition in DC firefighters nine months after initial implementation. The first hypothesis stated after implementation of an exercise and nutritional counseling program, there will be a statistically significant reduction in body composition as measured by skin fold calipers in DC firefighters nine months later. The level of significance was set at .05.

Table 2 displays the results of the analysis. The mean for pre-body fat composition was 14.52 % and post- body fat composition was 14.19 %. There was no significant difference (p = .225) between pre-and post- body composition measurements.

Table 2

Pre-Post Body Composition Analysis

Source	n	Mean (SD)	t	Df	Sig.
Pre-body comp (%)	202	14.52 (4.41)			
Post-body comp (%)	202	14.19 (4.70)			
Pre-post body comp (paired differences)		.3243 (3.7866)	1.217	201	.225

Because there was not any significant difference found between pre- and post-body fat composition measurements looking at the general population, another analysis was conducted to determine if there were any interactions between body fat composition, gender, and race. A repeated measures ANOVA was used to analyze the association between body fat composition and gender. The results are displayed in Table 3. The Mauchly's Test of Sphericity was not significant so the univariate results were reported. The within subjects effects showed no significant difference between pre- and post- body fat composition (p =.299). There was not any significant interaction between body fat composition and gender (p =.583). However, there was a statistically significant difference between men and women in body composition.

Table 3

Pre-Post Body Composition Analysis Interaction with Gender

Source	n	Mean	F	df	Sig.
Pre-Post Body comp (within subjects effects)	202		1.085	1.000	.299
Body Comp & Gender (interaction)	202		.303	1	.583
Gender (between subject effects)			47.348	1	.000
Male- pre Body comp (%)		14.069			
Male- post Body comp (%)		13.780			
Female –pre Body comp (%)		22.382			
Female-post Body comp (%)		21.445			

The second repeated measures ANOVA test analyzed race and pre- and post-body composition. The results are displayed in Table 4. The Mauchly's Test of Sphericity was not significant so the univariate results were reported. The within subjects effects

showed no significant difference between pre- and post- body composition (p =.655). There was a significant interaction between race and body composition (p =.025). This significant interaction represented looking at within-subject effects. This analyzed the significance of individuals within the group. The means for African Americans pre- body composition was 14.59% and post body composition was 14.76%. Caucasian pre- body composition mean was 14.50% and post- body composition was 13.13%. There were only 3 Hispanics represented in the sample and their means are pre-body composition 11.90% and post-body composition was 12.10%. There was not a significant difference between the various race groups and body composition (p =.241). This was the between-subject effects which looked at the difference of the 3 race groups, group comparisons. African Americans and Hispanics body fat compositions went up compared to that of their Caucasian counterparts.

Table 4

Pre-Post Body Composition Analysis Interaction with Race

Source	n	Mean	F	df	Sig.
Pre-Post Body comp (within subjects effects)	202		.200	1.000	.655
Body Comp & Race (interaction)	202		3.738	2	.025
Race (between subject effects)			1.434	2	.241
African American- pre Body comp (%)		14.590			
African American - post Body comp (%)		14.760			
Caucasian – pre Body comp (%)		14.500			
Caucasian- post Body comp (%)		13.132			
Hispanic-pre Body Comp (%)		11.900			
Hispanic-post Body Comp (%)		12.100			

For the second research question and hypothesis, a paired *t* test was used to analyze the data. The second research question asked if an exercise and nutritional counseling program increased fitness levels in DC firefighters nine months after initial implementation. The second hypothesis stated that after implementation of an exercise and nutritional counseling program there would be a statistically significant increase in fitness levels as measured by the sub-maximal 3-minute step test in DC firefighters. Table 5 displays the results of the analysis. The group mean for the pre-fitness testing was 94.39 beats/min and the post- fitness testing was 91.08 beats/min. There was a significant difference (p = .004) between pre- and post- fitness testing measurements.

Table 5

Pre- and Post- Fitness Testing Measurement Analysis

Source	n	Mean (SD)	t	df	Sig
Pre-fitness test	202	94.39 (13.081)			
Post-fitness test	202	91.08 (11.02)			
Pre-post fitness test (paired differences)		3.307 (16.013)	2.935	201	.004

A secondary analysis was done to look at race and fitness testing using a repeated measures ANOVA test. The results are displayed in table 6. The Mauchly's Test of Sphericity was not significant so the univariate results were reported. There was not a significant interaction between race and fitness testing (p =.501). This interaction

represented looking at within-subject effects. This analyzed the significance of individuals within the group. There was a significant difference between the various race groups (p =.010). This was the between-subject effects which looked at the difference of the 3 race groups, group comparisons. The means for African Americans for fitness1 was 95.36 beats/min and fitness 2 was 92.74 beats/min. This was a decrease of 2.62 beats/min. The means for Caucasians for fitness1 was 92.43 beats/min and fitness 2 was 87.43 beats/min. This was a decrease of 5.0 beats/min. The means for Hispanics for fitness1 was 93.33 beats/min and fitness 2 was 96.00 beats/min. This showed an increase of 2.67 beats/min.

Table 6

Pre- and Post- Fitness Testing Interaction with Race Analysis

Source	n	Mean	F	df	Sig
Fitness Race (within subject)	202		.693	2	.501
Race (Between subjects)	202		4.755	2	.010
African American(Fit1)		95.358			
African American(Fit2)		92.739			
Caucasian(Fit1)		92.431			
Caucasian(Fit2)		87.431			
Hispanic(Fit1)		93.333			
Hispanic(Fit2)		96.000			

For the first hypothesis the null is accepted: after implementation of an exercise and nutritional counseling program there was no difference in body composition as measured by the skin fold caliper in DC firefighters nine months later.

For the second hypothesis the null is rejected: after implementation of an exercise and nutritional counseling program there was an increase in fitness levels as measured by the sub-maximal 3-minute step test in DC firefighter nine months later.

Summary

Although the primary analysis yielded no significant differences with pre- and post- body composition, there were differences seen with pre- and post- fitness test measurements. The secondary analysis did yield some significant results. Men and women showed significant differences in body compositions. There was a significant interaction between race and body composition. There was also a significant difference between race groups and fitness test measurements. Chapter 5 will further discuss these results and present recommendations. Study limitations will be highlighted further and suggestions for future studies will also be discussed.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this study was to examine the effectiveness of an exercise and nutrition counseling program on body fat composition and exercise in fitness levels in DC firefighters. In this chapter, I will summarize the results, recommendations for social change, action, future research, and study limitations.

Interpretation of the Findings

This study used archival data from a DC Fire wellness program to analyze firefighters' pre- and post- body fat composition and fitness. The study population was 202 DC firefighters, including 191 males and 11 females. Because there was a lack of literature as to the effectiveness of fitness programs with a predominately African American firefighter population, this study's population addressed that issue by being comprised of a majority African American firefighter population (66.3%). Previous studies were largely made up of Caucasian firefighter populations (Davis, Jankovitz, & Rein, 2002; Roberts et al., 2002).

A paired *t* test was employed to analyze pre- and post- body fat composition data. There was no significant difference ($p = .225$) between pre- and post- body fat composition measurements in the overall study population. Therefore the null hypothesis was not rejected. Statistically, body fat composition was found to have not been reduced nine months after implementation of the exercise and nutrition program.

An additional analysis was done to determine what interaction, if any, existed between differences in body composition throughout the program with gender and race.

The first analysis looked at the relationship between gender and what changes occurred with body fat composition. Male and female gender groups differed significantly between pre- and post- body fat composition means. Males decreased their mean post- body fat composition measurement by .298%. Females also decreased their post-body fat composition measurements by .937%. Clinically, ranges in 2-5% range are deemed a successful program. These findings suggest that this voluntary program may not be successful at reducing body fat composition.

The second additional analysis looked at the interaction between pre-post body composition and race. There was a significant interaction seen between race and body fat composition measurements. This represented the significant changes the individuals within the group made towards their body fat composition measurements. There were not any significant differences seen between race groups and changes in body fat composition. This represented a between-subject comparison of all 3 racial groups, group comparison. African Americans experienced an increase of .170% in mean post-body fat composition measurements compared to their pre-body fat composition measurements. Caucasians experienced a decrease of .368% from pre- to post- body fat composition measurements. Hispanics, while only 3 in the sample also experienced an increase of .200% from pre- to post body fat composition measurements. African Americans and Hispanics both experienced the increase in body fat composition measurements. These differences can be attributed to many factors which will be explained further below, and in the Limitations section of chapter 1. Clinically, these decreases are not large enough to

be deemed successful even though decreases are good for the individual to continue to build upon.

Many contributing factors may lead to the non-significant findings of the body composition results. Non-compliance with the prescribed exercise program is one contributing factor. Because program compliance was not measure, there was no way to determine who truly exercised and who did not. American College of Sports Medicine (ACSM) recommends activities that promote cardiovascular endurance and weight training that will increase and maintain fat free weight (ACSM, 2006). Exercising at the required intensity, in conjunction with the appropriate nutrition, is the additional requirement for successful reduction in body fat composition as exercise alone cannot reduce body fat composition.

Nutrition is the next contributing factor that may have led to non-significant findings. If participants were not eating nutrient-rich foods but instead eating high caloric foods, and not getting enough physical activity, they would be less likely to burn the calories being taken in. Because compliance to the nutrition program was not maintained, there was no way of interpreting how well the firefighters complied with the program. There is no way of documenting if the firefighters prepared healthier meals at the firehouses or practiced correct portion sizes after attending the nutrition program. Fried foods and fast foods are often the foods of choice for firefighters; these foods tend to be high in fat and cholesterol content and will increase body fat composition (Kieffer et al., 2006). If one takes in more nutrients than what one is able to burn through physical activity, the body will convert this excess to fat. High amounts of body fat along with

being overweight are contributing risk factors for cardiovascular disease that are modifiable. For this population that has a high risk for cardiovascular disease, watching their diet and increasing exercise frequency is necessary.

An additional contributing factor to the non-significant findings of the body fat composition measurements was the voluntary basis of participation. Compliance was not measured for nutrition and exercise, there was no way to determine if these firefighters participated in the program 100% of the time at their maximum ability during the entire duration of the program. Voluntary programs often have less-than-optimal participation and the results may lead to non-significant findings. Participants could sabotage their results by either not fully participating because they do not support the program or the administration that is running the program. This non-support may not be detected until after the final measurements are taken. Mandatory programs are seen as having more productive results relating to body fat composition measurement reduction versus voluntary programs. Some mandatory programs have produced some reduction in body fat composition measurements by 2.48% after the 1st year of the program compared to voluntary programs (Green & Crouse, 1991). Clinically successfully programs strive for 2-5% decreases in body fat composition reduction. These programs also aim for reductions to be maintained for more than one year.

A paired *t* test was used to analyze pre- and post- fitness testing measurements. There was a significant difference ($p = .004$) between pre- and post- fitness testing measurements therefore the null hypothesis was rejected. A secondary analysis was done to determine if an interaction existed between fitness testing measurements and race.

There was a significant difference (p = .010) between various race groups. African Americans and Caucasians experienced a decrease in recovery heart rates which in turn is consistent with an increase in fitness levels. Hispanics were found to have an increase in their recovery heart rates, which in turn is consistent with a decrease in fitness levels.

Previous studies also found similar results of increasing fitness levels within the firefighter population. Roberts et al. (2002) found similar results in their study in the ability to increase fitness levels in firefighter participants. Roberts et al. found an increase of 28% in fitness levels after their 16-week mandatory fitness program. This increase is greater compared to this study which only found a 3% increase in fitness levels, but still within statistical and clinical parameters as a benchmark. By increasing their cardiovascular fitness levels, risk from cardiovascular disease was reduced by remaining physically active through exercise.

Even though this was a voluntary program, the results were significant and similar to what has been seen to mandatory programs as it relates to fitness. As stated previously, compliance was not monitored; there was no way to determine how clearly the firefighters followed their prescribed exercise regimens. The firefighters may have not followed their prospective exercise programs, performed alternative physical activities, or followed a peer's regiment instead.

These results were interesting in that body fat composition results did not decrease but fitness levels increased. This population scored in the good range for their pre-fitness test measurements which may be attributed to the physical demand of their occupation. They also could continue to do their exercises which would help increase

their cardiovascular response to the fitness test. While on-duty, the firefighters have down time and could possibly eat foods that could counterbalance what they are doing from an exercise perspective. If an individual takes in more calories than can be burned from physical activity, then the body will store this as fat. This increase in body fat composition could have occurred with these firefighters. Again, with this group there is no way of telling how closely they complied with the nutritional program.

Other studies have found either reductions in both body fat composition and fitness levels, or no change in either, although some of these studies were looking for a long term reduction and increase. Green and Crouse (1991) studied 24 firefighters over a 5-year period to determine how much improvement would be seen in VO_2max and body fat composition after implementing a mandated program. There was a mean fat percentage of 1.43% across 5 years with the greatest difference of 2.48% after the 1st year of the program. There was a significant difference in VO_2 max across 5 years with the greatest improvements seen after the 1st year with a mean of 40.69ml O_2kg or 11.63 METS. From a short term perspective, another study took firefighter recruits and trained them during a 16-week mandatory program (Roberts et al., 2002). Roberts et al. were able to increase the physical fitness of firefighters by 28 % and decrease their body fat composition from 14.6% to 13.0%. Although these aforementioned studies did show improvements at various times, this is the first study to have achieved mixed results.

Theoretical Basis of the Study

The data analyzed in this study were from programs that were grounded in the social learning theory (SLT). This theory was described in greater detail in chapter 1. The

environment and social networks play large roles in this theory (Berkman, 1995). As more peers in the firefighter network begin adopting healthier behaviors and lifestyles, other individuals in the same networks will soon adopt those same behaviors (Elliot et al., 2004). This behavior can take the form of firefighters mirroring the healthy lifestyles and behaviors of their commanding officers and/or supervisors or others that they share very close social networks with.

This theory could help explain why fitness levels increased among firefighters. Peers could help each other with exercises. Elliot et al. (2004), Elliot et al., (2007), and Moe et al.,(2002), all utilized the social learning theory. The studies found that greater achievements were gained in group settings due to the peer networks and group cohesions versus an individual intervention (Elliott et al., 2004; Elliott et al., 2007; Moe et al. 2002). Elliott et al. (2007) reported a significant increase in nutritional and fitness changes in the group setting.

There were observed differences with body fat composition in African American and Hispanics. African American and Hispanic groups had higher body fat composition compared to their Caucasian counterparts even though they are peers. As for fitness testing, African Americans and Caucasians were able to increase their fitness levels compared to Hispanics. Hispanics experienced a decrease in fitness levels. Even though they are all peers, each racial group has their own social network. This can challenge the theory in that the program from its inception has to make sure it addresses all potential disparities or cliques that may be present in the firefighter community.

Implications for Social Change

Heart disease is the leading cause of on-duty deaths of firefighters. One of the major risk factors for cardiovascular disease is obesity and overweight. The lack of exercise and physical conditioning is an area of concern for the safety of both firefighter personnel and the public as the ability to perform their job declines significantly. The emphasis on continual physical fitness testing and training after becoming a firefighter is not stressed or made mandatory in some jurisdictions.

Allowing and authorizing protected time or mandating time to exercise while on duty may help to control weight gain and increase physical conditioning in the firefighting population (Moulson-Litchfield & Freedson, 1986). Physical fitness will help increase their productivity and help decrease work related injuries. By increasing physical conditioning and exercise, firefighters will decrease the cardiovascular disease risk factors. The firefighter adopting healthier behaviors at work by exercising will translate into a healthier workforce.

The results of this study revealed an increase in fitness levels and an increase in body fat composition. This program was voluntary but the results may have been more favorable if the program was made mandatory. With results such as these, firefighters could potentially continue to gain more body fat and stop exercising if they know they are not held accountable. With a voluntary program, that's the risk that is taken, however with the mandatory program, everyone participates. This program would help the firefighters in nutrition and exercise thus helping them attain their goals of being a healthier workforce.

Limitations of this Study

As limitations to this study were initially outlined in chapter 1 specifically relating to the nature of the archival data, here more explanation will be given to additional limitations and compliance to programs also noticed. Personalized exercise programs and nutritional guidance were given to firefighters which in theory would have helped with reduction in body composition and improve cardiovascular fitness. However, nothing was put in place to measure compliance of this voluntary exercise program with the firefighters.

Due to this missing measure, there is an inability to determine if firefighters followed their prescribed exercise programs at the set intensity to get the maximum benefit. This measure would also track compliance to the prescribed exercise program versus some other exercise program the firefighters may be participating in. This compliance measure was essential for the fitness component of the program and the nutrition component as well. The nutritional compliance was not measured so therefore there was no way to determine how well firefighters were following the program recommendations. This nutritional component in conjunction with the exercise component was needed to help reduce body composition. As discussed previously, there was not a significant reduction in body composition but if compliance was measured further recommendations could be made based on those observations. Those recommendations could be types of physical activities that were more appropriate, and types of foods and nutritional guidance needed to be further addressed based on the participation. Even though compliance was not measured here, looking to corporate

programs compliance rates seen in corporate wellness programs without incentives averaged at 61% while programs with incentives can average above 61% (Carnethon et al., 2009).

In this program, firefighters were required to complete exercise regimens on their own time and during their assigned work shift. Therefore, it would make it difficult to determine if the results were due to the program solely. The participants could do other activities to increase cardiovascular fitness on their own not following the recommended exercises given to them.

Another limitation to note is the structure of the program itself. The program was instituted in parts, fitness test done first with the exercise program then given. Following the exercise program which was given to the entire fire department, the nutritional component was then administered. These two programs were administered with a 6 month lapse in time and the final assessment was then administered 9 months later. The timing of the intervention could affect participation, results and administration of the program. After instituting a program, good analysis of the data cannot effectively be done with lapse in time and/or poor administration of the program. Roberts et al. (2002) conducted their 16-week program on firefighter recruits while administering both fitness and nutritional programs at the same time. They also administered the final assessment to attain their results at the end of week 16 (Roberts et al. 2002). Green and Crouse (1991) studied firefighters over a 5year period also administered both fitness and nutritional programs together but conducted their assessments after each year over the entire 5 year period. While the program used in this study did not follow the same program structure as

those programs previously cited, the program still relied upon the components of nutrition and fitness for potential significant outcomes. The results of this study revealed significant increase in fitness levels for the firefighters.

Recommendation for Action

Even though there was significant increases seen in fitness levels and no significant decreases seen in body composition, exercise and nutrition programs should still be stressed in this firefighter population. Exercise programs geared towards physical conditioning will help reduce cardiovascular disease risk factors in this population. Nutrition programs focused on the basics of food preparation, portion control, and how to replace nutrients are also needed for their jobs and energy expenditure while exercising.

Obesity and overweight are major modifiable risk factors for cardiovascular disease (CVD). Firefighters are an occupation at a greater risk for CVD as 45% of on duty deaths were a result of heart attacks (Kales et al., 2007). Obesity and overweight are a modifiable risk factor that can be addressed through successful exercise and nutrition programs.

To have that successful program in the fire department, there must be top down support from the fire chief. The fire chief must fully endorse/support the program as well as participate in the program (LACOFD, 2006). Once the fire chief does this, other management and support staff will follow with participation. As the results of this study indicate that voluntary programs are only slightly successful, the program should be made mandatory to exercise while on duty with the support of the fire chief. This endorsement from the fire chief will send the message that the department firmly believes

in firefighters' quality of life and it is willing to make the investment and creating a healthier workforce. This endorsement will further create a culture of health that promotes fitness (Garver et al., 2005).

The next enhancement is to deploy peer fitness trainers which could further participation and compliance. This concept is grounded in the social learning theory by using their social networks to increase the awareness of health and wellness in this population (USFA, 2009). A peer fitness trainer is a firefighter who has completed a fitness trainer certification course through a certifying body such as American Council on Exercise (ACE). Peer fitness trainers train and recondition their colleagues. Some are used at the firefighter academy levels but others are used at the worksite to schedule on-duty exercise for current firefighters. By being firefighters and now trained fitness trainers, they can give personalized exercise programs to their peers as well as tailor programs to the rigors of their job. These trainers can help these firefighters better use exercise equipment that is available to them as well as participate in other group activities that will enhance fitness.

In addition to what has been mentioned above, participation and compliance to the programs should be monitored for all participating firefighters. If the program becomes mandatory, compliance still needs to be maintained for exercise and nutritional program enhancements. Without this component, the limitations of this study will be repeated. It is imperative to put these programs into effect to get more firefighters engaged in promoting healthier lifestyles, training their comrades and preparing the workforce to be better conditioned.

Recommendation for Future Research

Future research should be conducted within this population by increasing the study timeframe greater than 9 months. With proper compliance measures in place, looking at the same variables over a 3 year time span would be interesting to determine what significance can be achieved in a mandated versus voluntary program. Looking at a longer period of time such as 3 years, using the same variables, would determine whether a significant decrease in body composition and continued increased in fitness measurements can occur. Occupational stress should also be an additional variable studied in conjunction with exercise and body composition. Stress can have negative effects on eating habits, weight and exercise intensity. Stress can adversely affect one's ability to effectively lose weight as well as successfully exercise. Stress can also inhibit one's ability to sleep, which added to the work environment can create an unhealthy situation. These firefighters have a schedule of 24 hours on duty and 48 hours off duty while many may have other responsibilities outside of this career. With the stressors of this career compounded with bad eating habits and not regularly exercising at moderate levels and not sleeping well can affect their health. Stress should be a definite variable to be considered as there are many components that should be looked at in this population. Stress affects the ability to sleep, productivity at work, exercise, and eating habits to name a few.

Conclusion

Although there was no significant difference found between pre- and post- body composition measurements, there was a significant difference with pre- and post- fitness testing. Increased levels of exercise and physical conditioning and improved nutritional habits can contribute to reduced risks for being overweight and obese. Programs that are mandated for this population to exercise, while on duty, substantially will help reduce the prevalence of heart attack, weight gain and cardiovascular disease. The fire administration needs to consider taking a more active role in mandating programs that will improve firefighter's health, wellness and safety.

References

American College of Sports Medicine (ACSM) (2006). *ACSM's guideline for exercise testing and prescription*. (7th ed). Baltimore,MD: Lippincott Williams & Wilkins.

American Heart Association (2008). *Heart and stroke encyclopedia*. Retrieved from http://www.americanheart.org/presenter.jhtml?identifier=4478.

Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall. pp 23-30.

Bartholomew,L., Parcel,G., Kok, G., Gottlieb,N. (2006). *Planning health promotion programs: an intervention mapping approach*. San Francisco,CA: Jossey-Bass. (pp 128-131).

Berkman, L. (1995). The role of social relations in health promotion. *Psychosomatic Medicine*, *57*, 245-254. Retrieved from http://www.psychosomaticmedicine.org/content/by/year.

Bycezk,L., Walton,S., Conrad,K., Reichelt,P., Samo,D. (2004). Cardiovascular risks in firefighters: implications for occupational health nurse practice. *AAOHN*, *52*, 66 76. Retrieved from http://www.aaohn.org.

Cady, L., Thomas,P., Karwasky,R. (1985). Program for increasing health and physical fitness of fire fighters. *Journal of Occupational Medicine*,*27* (2), 110-114. Retrieved from http://journals.lww.com.

Carnethon, M., Whitsel,L., Franklin,B., Kris-Etherton,P., Milani,R., Pratt,C., Wagner,G.

(2009). Worksite wellness programs for cardiovascular disease prevention. A policy statement from the American Heart Association. *Circulation*,*120,*1725-1741. doi: 10.1161/CiculationAHA.109192653

Centers for Disease Control and Prevention (CDC).(2005).*Public health strategies for preventing and controlling overweight and obesity in school and worksite settings*. Retrieved from http://www.cdc.gov/mmwr.

CDC.(2004). The Community Guide. *Community guide on physical activity*. Retrieved 7/30/06 from http://www.thecommunityguide.org/pa/.

Creswell, J. (1994). *Qualitative inquiry and research design: choosing among five approaches*. (2nd ed.) Thousand Oaks: Sage.

Cossrow,N., & Falkner,B. (2004). Race/ethnic issues in obesity and obesity-related comorbidities. *Journal of Clinical Endocrinology & Metabolism*, *89*(6):2590-2594. Retrieved from http://www.jcem.endojournals.org.

Davis,S., Jankovitz,K., & Rein,S.(2002). Physical fitness and cardiac risk factors of professional firefighters across the career span. *Research Quarterly for Exercise and Sport*, *73*,363-370. Retrieved from http://www.aahperd.org.

Department of Health and Human Services (2000). *Healthy People 2010*. Retrieved from http://www.healthypeople.gov/2010/publications.

Dittmar, M. (2006, Dec). Firefighters and heart disease: beyond the statistics. *Fire Engineering*, *159*(12), 49-56. Retrieved from http://www.fireengineering.com.

Dorsten,L., & Hotchkiss, L (2005). *Research methods and society: foundations of social inquiry*. New Jersey: Prentice Hall.

Elliot,D., Goldberg,L., Duncan,T., Kuehl,K., Moe,E., Breger,R.,... Stevens,V. (2004). The PHLAME firefighters' study: feasibility and findings. *American Journal of Behavior*,*28*, 13-23. Retrieved from http://www.ajhb.org.

Elliott,D., Goldberg,L., Kuehl,K., Moe,E., Breger,R., Pickering,M. (2007). The PHLAME (Promotioning health lifestyles: alternative models'effects)Firefighter study: outcomes of two models of behavior change. *Journal of Occupational and Environmental Medicine*, *49*, 204-213. doi: 10.1097/JOM.0b013e3180329a8d

Faul,F., Erdfelder,E., Lang,A., Buchner,A. (2009) Statistical power analysis using G*Power 3.1: Tests for correlation and regression analysis. *Behavior research Methods*, *41*(4), 1149-1160. doi: 10.3758/BRM.41.4.1149

Garver,J., Jankovitz,K., Danks,J., Fittz,A., Smith,H., Davis,S. (2005). Physical fitness of an industrial fire department vs. a municipal fire department. *Journal of Strength and Conditioning Research*, *19*(2), 310-317. Retrieved from http://journals/lww/com/nsca-jscr/pages/issuelist.aspx.

Green, J., Crouse,S. (1991). Mandatory exercise and heart disease risk in fire fighters: a longitudinal study. *International Archives of Occupational Environmental Health*, *63*, 51-55. doi: 10.1007/BF00406198

Henderson,N., Berry,M., Matic, T. (2007). Field measures of strength and fitness predict firefighter performance on physically demanding tasks. *Personnel Psychology*, *60*, 431-473. doi: 10.1111/j.1744-6570.2007.00079.x

Kahn,E.,Ramsey L.,Brownson R,Heath G.,Howze E.,Powell K., et al. (2002). The effectiveness of interventions to increase physical activity. *American Journal*

Preventive Medicine, *22*, 73-107. doi: 10.1016/S0749-3797(02)00434-8

Kales, S., Soteriades,E., Christophi,C., Christiani,D. (2007). Emergency duties and deaths from heart disease among firefighters in the US. *New England Journal of Medicine*, *356*, 1207-1215. doi: 10.1056/NEJMoa060357

Kieffer,E., Sinco,B., Rafferty,A., Spencer,M., Palmisano,G., Watt,E., Heisler,M. (2006). Chronic disease-related behaviors and health among African Americans and Hispanics in the REACH Detroit 2010 Communities, Michigan, and the United States. *Health Promotion Practice*, *7*(3), 256s-264s. doi: 10.1177/1524839906289353

Killip,S., Mahfoud,Z., Pearce,K. (2004). What is an intracluster correlation coefficient? Crucial concepts for primary care researchers. *Annals of Family Medicine*, *2*(3), 204-208. doi: 10.1370/afm.141

Los Angeles County Fire Department (2006). *Inside fitness program*. Retrieved 8/31/08 from http://fire.lacounty.gov/behind/healthwellnessfitness.asp.

McArdle,W., Katch,F., Katch,V. (2001). *Exercise Physiology*. (5th ed). Baltimore,MD: Lippincott Williams & Wilkins.

Mensah,G., Mokdad,A., Ford,E., Greenlund,K., Croft,J. (2005). State of disparities in cardiovascular health in the United States. *Circulation*, *111*, 1233-1241. doi: 10.1161/01.CIR.0000158136.76824.04

Moe,E., Elliot,D., Goldberg,L., Kuehl,K., Stevens,V., Breger,R.,… Dolen,S. (2002). Promoting healthy lifestyles: alternative models' effects (PHLAME). *Health Education Research*, *17*(5), 586-596. doi: 10.1093/her/17.5.586

Moreland, K., Diez-Roux,Wing,S.(2006). Supermarkets and other food stores and obesity. *American Journal of Preventive Medicine*, *30*, 333-339. doi: 10.1016/j.amepre.2005.11.003

Moulson-Litchfield,M., Freedson,P. (1986). Physical training programs for public safety personnel. *Clinics in Sports Medicine*, *5*, 571-587. Retrieved from http://www.sportsmed.theclinics.com/.

Munro,B. (2005). *Statistical methods for healthcare research*. (5th ed). Baltimore,MD: Lippincott Williams & Wilkins.

Naghii,NR.(2006). Importance of body weight and weight management for military personnel. *Military Medicine*, *171*,550-555. Retrieved from http://www.amsus.org/index.php/journal.

Nieman,D. (2003). *Exercise testing and prescription: a health related approach*. (5th ed). New York: McGraw Hill.

Pan,L., Galuska,DA., Sherry,B., Hunter,AS., Rutledge,GE., Dietz,WH. (2009). Differences in prevalence of obesity among Black, White, and Hispanic-United States 2006-2008. *MMWR*, *58*(27),740-744. Retrieved from http://www.cdc.gov/mmwr.

Pollock,M., Wilmore,J. (1990). *Exercise in health and Disease*. (2nd ed). Philadelphia,PA: W.B. Saunders Company.

Powell,LM., Slater,S., Chaloupka,FJ. (2004). The relationship between community physical activity settings and race, ethnicity and socioeconomic status. *Evidence Based Preventive Medicine*, *1*(2), 135-144. Retrieved from

http://impacteen.econ.uic.edu/journal_pub/pub_PDFs/EBPM-1-2-Powell%20et%20al1.pdf.

Pynes,J. (2001). Implementing health and fitness programs for firefighters. *Public Personnel Management*, *25*(2), 237-242.

Rhea,M., Alvar,B., Gray,R. (2004). Physical fitness and job performance of firefighters. *Journal of Strength and Conditioning Research*, *18*(2), 348-352. doi: 10.1519/00124278-200405000-00026

Roberts,M., O'Dea,J.,Boyce,A., Mannix,E. (2002). Fitness levels of firefighter recruits before and after a supervised exercise training program. *Journal of Strength and Conditioning Research*, *16*(2), 271-277. doi: 10.1519/00124278-200205000-00016

Rosenstock, L., Olsen, J.(2007). Firefighting and death from cardiovascular causes. *New England Journal of Medicine*, *356*, 1261-1263. doi: 10.1056/NEJMe078008

Santo, A., Golding L. (2003). Predicting maximum oxygen uptake from a modified 3 minute step test. *Research Quarterly for Exercise and Sport*, *74*, 110-115. Retrieved from http://www.aapherd.org.

Singleton,R., Straits,B.(2005). *Approaches to social research*. (4th ed). New York:Oxford.

Soteriades,E., Hauser,R., Kawachi,I., Liarokapis,D., Christiani,D., Kales,S.(2005). Obesity and cardiovascular disease risk factors in firefighters: a prospective cohort study. *Obesity Research*, *13*,1756-1763. doi: 10.1038/Oby.2005.214

Sowers, J., Ferdinand,K., Bakris,G., Douglas,J. (2002). Hypertension-related disease in

African Americans factors underlying disparities in illness and its outcome. *Postgraduate Medicine*, *112*(4), 24-32. Retrieved from http://pmj.bmj.com.

Treadwell,H., Ro,M. (2003). Poverty, race, and the invisible man. *American Journal of Public Health*, *93*, 705-707. doi: 10.2105/AJPH.93.5.705

US. Army Center for Health Promotion and Preventive Medicine (USAHPPM)(n.d.). Targeting Fitness: Civilian Health Promotion Program. Fitness assessment. Retrieved from http://www.hooah4health.com/toolbox/targetingfitness/progguide.htm.

United States Census Bureau. *State and County Quick Facts 2007*. Retrieved from http://quickfacts.census.gov/qfd/states/11000.html.

US. Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics (2008). *Prevalence of overweight and obesity among adults: United States, 2003-2004*. Retrieved from http://www.cdc.gov/nchs/data/hestat/overweight/overweight_adult_03.htm.

United States Fire Administration (USFA)(2007). US firefighter fatalities in the US, 2007. Retrieved from http://www.usfa.dhs.gov/downloads/pdf/publications/ff_fat07.pdf.

Watkins, J. (1984). Step tests of cardiorespiratory fitness suitable for mass testing. *British Journal of Sports Medicine*, *18*, 84-89. doi: 10.1136/bjsm.18.2.84

Williams, D. (2003). The health of men. *American Journal of Public Health*, *93*,724-731. doi: 10.2105/AJPH.93.5.724

Williford,H., Scharf-Olson,M.(1998). Fitness and body fat. *Fire Engineering*, *151*, 58-62.

Retrieved from http://www.fireengineering.com.

Appendix A: Exercise Educational Booklet

THE BENEFITS OF BEING FIT

BRAIN

- Concentration and alertness are improved.

SKIN

- Fitness promotes a healthy complexion.

LUNGS

- Lungs can process more oxygen with each breath.
- *Extra* demands for oxygen (e.g., running for a bus) can be met with *ease*.

MUSCLES

- Fit muscles have better tone, strength, and endurance.
- Muscles can work harder, with less fatigue.
- Posture and overall appearance are improved.

HEART

- A fit heart works more efficiently and with less strain.
- A fit heart beats fewer times per minute while at rest than an unfit heart.
- The heart can meet *extra* demands with *ease*.

BLOOD VESSELS

- Blood circulation to all parts of the body is improved.
- The blood flows through the blood vessels more easily.
- Blood pressure is normally lower and strain on the circulatory system is not as great.
- The tendency to develop atherosclerosis (hardening of the arteries) is reduced.

DIGESTIVE SYSTEM

- Digestion and waste removal are improved.
- Appetite is controlled.

BLOOD

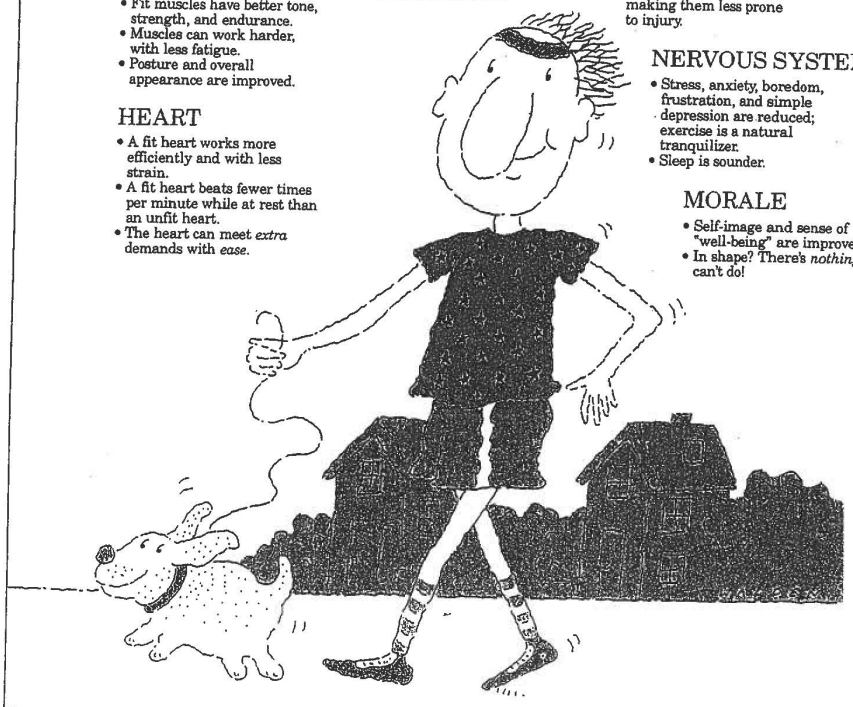
- The blood can deliver more oxygen to cells.
- The blood can remove more waste products from cells.
- Blood chemistry is improved so that risk of heart attack and stroke is reduced.

BONES

- Bones are stronger and less brittle.

JOINTS

- Joints are more flexible—allowing greater ease and range of movement, and making them less prone to injury.

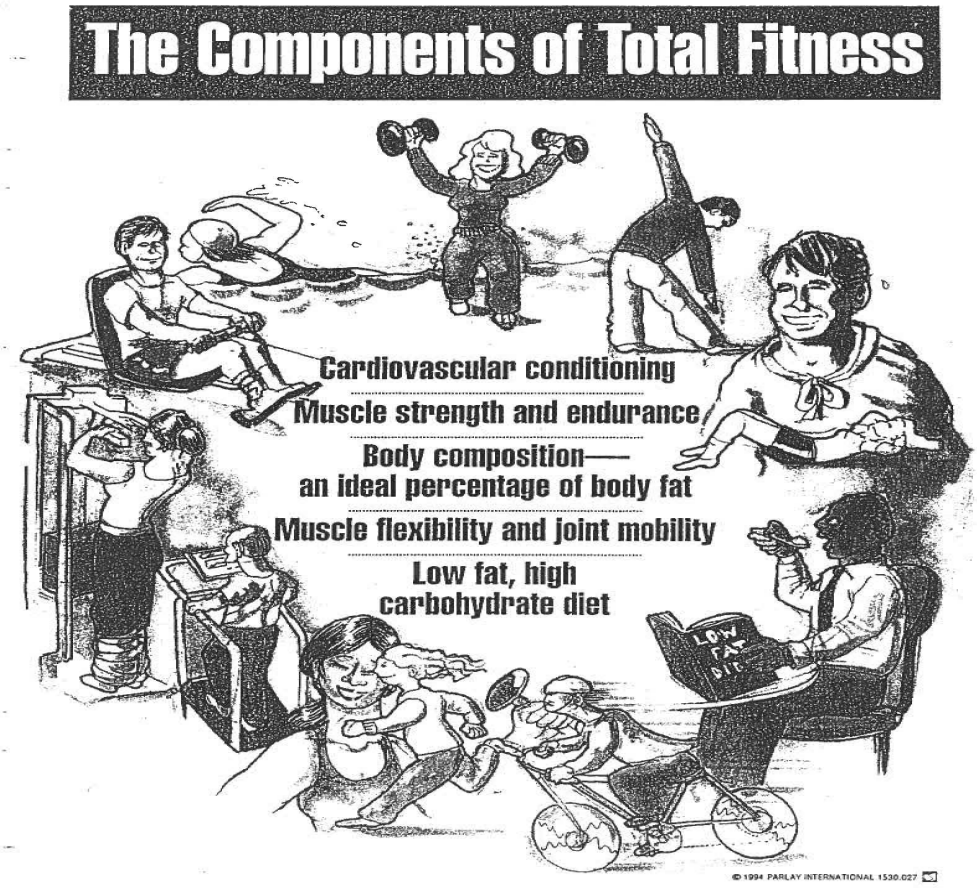


NERVOUS SYSTEM

- Stress, anxiety, boredom, frustration, and simple depression are reduced; exercise is a natural tranquilizer.
- Sleep is sounder.

MORALE

- Self-image and sense of "well-being" are improved.
- In shape? There's *nothing* you can't do!


The Components of Total Fitness
Cardiovascular conditioning
Muscle strength and endurance
Body composition—
an ideal percentage of body fat
Muscle flexibility and joint mobility
Low fat, high
carbohydrate diet
LOW FAT DIET
© 1994 PARLAY INTERNATIONAL 1530.027

RESISTANCE TRAINING

Men & women of all ages can benefit from resistance training. Cardiovascular exercise, flexibility, muscle strength and muscular endurance are all components of fitness. A well-rounded fitness program should include exercises that will improve all of these components.

Before starting your exercise program you should have a complete physical. This will insure that your exercise program is safe and if certain medical conditions exist, your doctor can make the appropriate recommendations.

This handout will review some of the guidelines to follow when using all types of resistance equipment with an emphasis on free weights.

GENERAL GUIDELINES:

1. Always warm-up before 5-10 minutes and cool-down after lifting weights to reduce the risk of injury and post- workout muscle pain.

2. Stretch each muscle group immediately after working it.

3. Perform each exercise slowly using controlled movements.

4. Be conscious of your breathing while lifting weights . You should exhale as you lift the weight and inhale as you lower it.

5. Be aware of you form at all times. Do not lock the joints and be aware of the stress placed on your lower back.

6. Give your muscles 48 hours of rest in between weight workouts to insure muscle recovery. It is very important that when you strength train that you do not work the same muscle group two days in a row. This rule does not apply to aerobic activity which can be done 3 -7 times a week.

7. Whenever possible, workout with a partner. You can correct form as well as spot when needed. This will minimize the risk of injury.

8. Start slowly and progress gradually. Increase your weights by small increments as you become stronger. This will also assist in minimizing the risk for injury.

9. If your goal is to "increase" the size and strength of your muscles, you should use heavier weights and perform fewer repetitions (2 - 7). If your goal is to increase muscle tone and muscle endurance, you will use lighter weights and perform more repetitions (1 to 3 sets of 8 - 15 repetitions).

The "overload" principle is the key to improvement in a weight training program. This states that the body adapts to the physical demands placed upon it. These demands must be increased for continued improvement. In other words, you have to gradually and progressively make the program harder in some aspect to receive the maximum benefits.

CARDIOVASCULAR PRESCRIPTION

REASONS TO PERFORM CARDIOVASCULAR EXERCISE:

- Strengthen heart and lungs which reduces the risk of heart disease and stroke
- Increases the efficiency of the cardiovascular system which will result in less fatigue
- Assist in burning calories thus assisting with weight control//reduction
- Lower blood pressure and blood lipid levels (triglyceride - cholesterol)
- Lower resting heart rate

Frequency - 3 to five days a week

Intensity - 65 to 90% of your maximum heart rate

Time - 20 to 60 minutes of continuous exercise

Type - Any cardiovascular activity using the large muscle groups of the body with continuous rhythmical movement i.e. walking, dancing, jogging, biking, roller blading, group exercise, skiing, swimming

Guidelines For A Total Fitness Program

Three components of fitness	F.	I.	T.	T.
***	Frequency	Intensity	Time	Type
STRENGTH	2 – 3 times per week on alternate days	Train with 75% of how much you can lift one time	40–70 sec for 8 –12 repetitions	Each major muscle group in the body.
FLEXIBILITY	3 – 5 days per week before or after exercise	Stretch until you feel mild tension. NO PAIN	STATIC: No bouncing or jerking	Remain in the stretch position for 15–30 secs.
CARDIO	3 – 5 days per week	60–80 percent of max heart rate	Continuous, rhythmic movements that use the large muscle groups	20–60 minutes, not including warm up or cool down

HOW MUCH? HOW OFTEN?

Minimum guidelines for squeezing aerobic exercise into a too-tight schedule.*

HOW TO FIND YOUR PULSE

If you've always had trouble locating your wrist pulse, follow these easy directions:

1. Hold your left (right, if you're a lefty) hand sideways as if you were going to shake hands. (Keep your thumb straight and press it to your hand.)
2. Place the middle three fingers of your right hand on the *outside edge* of your left thumb.
3. Holding your thumb straight and tightly to your hand, run your three fingers in a straight line past your "thumb pad" onto your wrist. You should find that your fingers are in a "groove" this side of your wrist bone. Press into this groove and you will find your pulse.

In a nutshell, the secre

F
FREQUENCY

The American College of Sports Medicine recommends that people exercise three, four, or five days a week.

Getting *less* than three days a week of aerobic exercise won't help you develop or maintain fitness, according to the College. Getting *more* than five days a week of aerobic exercise will help you burn extra calories, but there is a greater risk of injury if the body isn't given a little time off to rest.

If you choose to exercise just three days a week, exercise *every other day*, rather than three days in a row. There should *not* be more than two days between workouts, or some gains will be lost.

GIVE YOUR BODY A BREAK, AND IT WON'T BREAK DOWN

Exercising the *same* muscle group *everyday* can lead to trouble. Here are some options:

1. Do the most amount of exercise your present level of fitness will allow one day, then rest one day. Alternate days of exercise and rest.
2. Do the most amount of exercise your present level of fitness will allow one day; the next day, do the same exercise, but at a much slower pace.
3. Alternate muscle-group workouts, (e.g., jog one day, swim the next).

aximizing the benefits of aerobic exercise is to follow the F.I.T. Guidelines—

I
INTENSITY

Most of the "mystique" that surrounds aerobic exercise has to do with the intensity, or "pace."

The easiest way for a healthy adult to find a good, *aerobic* pace is to take the "Talk Test" while exercising: if your pace is such that your forehead feels "dewed" but you can still carry on a conversation with a fellow exerciser, your pace is probably just about right.

An aerobic pace should enable you to work up a slight sweat, but it shouldn't be so fast that it causes you to become breathless. If you find yourself huffing and puffing, and unable to converse with someone, slow down.

For the more "scientific" minded . . .

Another way to determine if your pace is an *aerobic* pace is to monitor your *exercising heart* (pulse) *rate.*

Since it is usually difficult to count your pulse while you are exercising, the general procedure is to stop exercising every five or ten minutes and immediately count your pulse for six (6) seconds. (The pulse must be taken *immediately* and counted for only *six* seconds, or it will *not* accurately reflect your heart rate during exercise.)

Researchers have found that if people keep their heart rates within a certain range for 15 to 20 *continuous* minutes, the exercise they do can contribute to cardiovascular fitness. This "range" is known as the "Target Zone."

The target zone

You can calculate your *Target Zone* yourself (subtract your age from 220 and take 70% and 85% of that figure to find your personal *Target Zone*—heart beats per minute), or you can use the chart below.

MEASURING YOUR EXERCISING HEART RATE

1. Every five or ten minutes, stop exercising and *immediately* count your pulse for *six* (6) *seconds*.
2. Your pulse rate should fall *within* the range given below for your age group. (If your pulse rate is *lower*, step up your pace; if it is *higher*, it is anaerobic and you should slow your pace.)

YOUR AGE	YOUR TARGET ZONE
20's	14 to 17 beats/ 6 seconds
30's	13 to 16 beats/ 6 seconds
40's	12 to 15 beats/ 6 seconds
50's	12 to 14 beats/ 6 seconds
60's	11 to 13 beats/ 6 seconds

ONLY BIRTHDAYS AFFECT YOUR TARGET ZONE

Your *Target Zone* is based upon your *age*; it is *not* related to your fitness level.

As you get in better and better shape, your *Target Zone* will remain the same. What will *change* is how much exercise you'll need to do to get your heart rate up into your *Target Zone*.

Someone who is *not* in shape might be able to get his heart rate up into his *Target Zone* with a brisk walk. Someone who is in better shape, however, might have to jog or do some brisk indoor cycling before his heart rate is so elevated.

As your level of fitness improves, you'll find that you'll have to step up your pace in order for your activity to remain aerobic; that is, in order for it to maintain your heart rate in your *Target Zone*. A brisk walk might be enough now but, in a few months, you might have to switch to jogging or cycling. When it's necessary to increase your pace in order to keep your heart rate up, you'll know your heart is becoming more efficient in the work it's doing.

T
TIME

As mentioned already, clinical studies have shown that it is necessary to keep the heart (pulse) rate in the *Target Zone* for at least 15 to 20 continuous minutes for cardiovascular benefits to be realized.

That's why stop-and-go exercise—like that you would get bicycling on a busy city street—can't promise to help keep your heart and blood vessels healthy. Stop-and-go exercise does *not* allow you to keep your heart rate in your *Target Zone* for 15 to 20 continuous minutes.

Weight-watchers need to invest more time

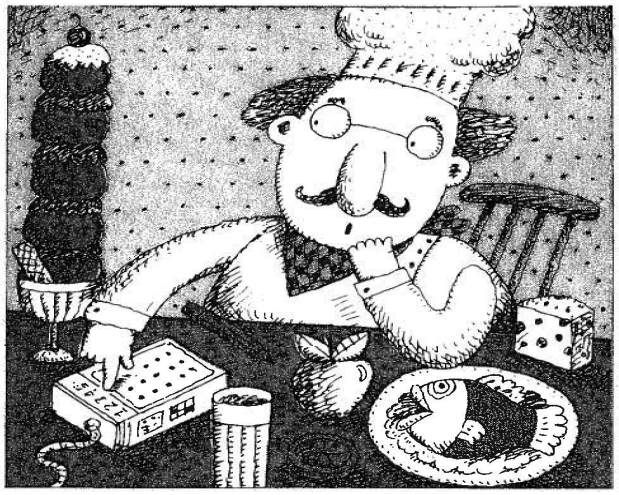
Although 15 to 20 minutes of aerobic exercise (where your heart rate is kept within your *Target Zone*) can help you in terms of cardiovascular fitness, it won't burn *that* many calories.

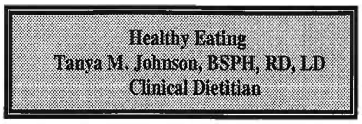
Serious weight-watchers should plan on getting at least 30 to 60 minutes of exercise per exercise session.

A reminder: these guidelines are simply *guidelines;* they are for *healthy* adults who have gotten their doctor's OK to begin an aerobic exercise program.

Appendix B: Nutritional Educational Booklet

Healthy Eating





AGENDA

- Healthy Eating: What is It?
- How to Eat Healthy and Lose Weight
- Eating Fast Food
- Supplements and Sports

FOOD GUIDE PYRAMID

A Guide to Daily Food Choices

The Pyramid is an outline of what to eat each day. It's not a rigid prescription, but a general guide that lets you choose a healthful diet that's right for you. The Pyramid calls for eating a variety of foods to get the nutrients you need and at the same time the right amount of calories to maintain a healthy weight.

The **Food Guide Pyramid** emphasizes foods from the five food groups shown in the three lower sections of the Pyramid.

Each of these food groups provides some, but not all, of the nutrients you need. Foods in one group can't replace those in another. No one food group is more important than another—for good health, you need them all.

17-HPP

Source: U.S. DEPARTMENT OF AGRICULTURE and the U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Provided by the Education Department of the NATIONAL CATTLEMEN'S BEEF ASSOCIATION.

How Many Servings Do You Need?

The **Food Guide Pyramid** shows a range of daily servings for each food group. The number of servings that is right for you depends on how many calories you need. Calories are a way to measure food energy. The energy your body needs depends on your age, sex and size. It also depends on how active you are.

In general, daily intake should be:

- ▲ 1,600 calories for most women and older adults;
- ▲ 2,200 calories for kids, teen girls, active women and most men; and
- ▲ 2,800 calories for teen boys and active men.

Those with lower calorie needs should select the lower number of servings from each food group. Their diet should include 2 servings of meat for a total of 5 ounces. Those with average calorie needs should select the middle number of servings from each food group. They should include 2 servings of meat for a total of 6 ounces. Those with higher calorie needs should select the higher number of servings from each food group. Their diet should include 3 servings of meat for a total of 7 ounces. Also, pregnant or breastfeeding women, teens and young adults up to age 24 should consume 3 servings of milk daily.

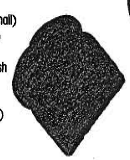
The amount of food that counts as one serving is listed below. If you eat a larger portion, it is more than one serving. For example, a slice of bread is one serving. A hamburger bun is two servings.

For mixed foods, estimate the food group servings of the main ingredients. For example, a large piece of sausage pizza would count in the bread group (crust), the milk group (cheese), the meat group (sausage) and the vegetable group (tomato sauce). Likewise, a helping of beef stew would count in the meat group and the vegetable group.

What Counts as a Serving?

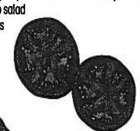
Bread, Cereal, Rice & Pasta Group

- 1 slice bread
- 1 tortilla
- ½ cup cooked rice, pasta or cereal
- 1 ounce ready-to-eat cereal
- ½ hamburger roll, bagel or English muffin
- 3-4 plain crackers (small)
- 1 pancake (4-inch)
- ½ croissant (large)
- ½ doughnut or danish (medium)
- 1/16 cake (average)
- 2 cookies (medium)
- 1/12 pie (2-crust, 8")



Vegetable Group

- ½ cup chopped raw or cooked vegetables
- 1 cup raw, leafy vegetables
- ¾ cup vegetable juice
- ½ cup scalloped potatoes
- ½ cup potato salad
- 10 French fries

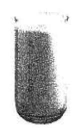


Fruit Group

- 1 piece fruit or melon wedge
- ¾ cup fruit juice
- ½ cup chopped, cooked or canned fruit
- ¼ cup dried fruit

Milk, Yogurt & Cheese Group

- 1 cup milk or yogurt
- 1½ ounces natural cheese
- 2 ounces process cheese
- 1½ cups ice cream or ice milk
- 1 cup frozen yogurt



Meat, Poultry, Fish, Dry Beans, Eggs & Nuts Group

2½ to 3 ounces cooked lean beef, pork, lamb, veal, poultry or fish

½ cup cooked beans or 1 egg or 2 tablespoons peanut butter or ⅓ cup nuts count as 1 ounce of meat

Lean Beef Choices

Round Tip
Top Round
Eye of Round
Top Loin
Tenderloin
Sirloin

Fats, Oils & Sweets

use sparingly

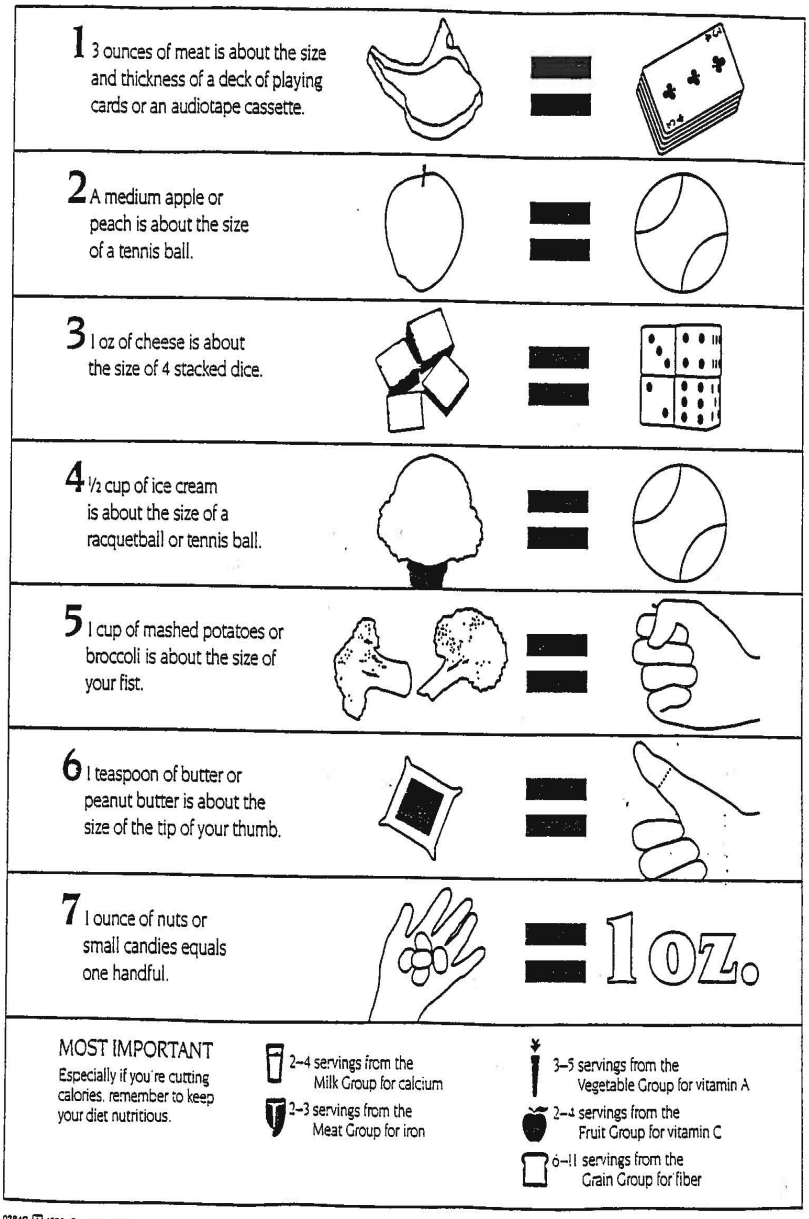
BEEF USA National Cattlemen's Beef Association

Published by the Education Department
NATIONAL CATTLEMEN'S BEEF ASSOCIATION
444 North Michigan Avenue/Suite 1800
Chicago, IL 60611
312 | 467-5520, ext. 262

Adapted from the Food Guide Pyramid, Home and Garden Bulletin Number 252, U.S. Department of Agriculture, Human Nutrition Information Service.
FOOD MODELS courtesy of NATIONAL DAIRY COUNCIL®

SEVEN WAYS TO SIZE UP YOUR SERVINGS

Measure food portions so you know exactly how much food you're eating. When a food scale or measuring cups aren't handy, you can still estimate your portion. Remember:



MOST IMPORTANT

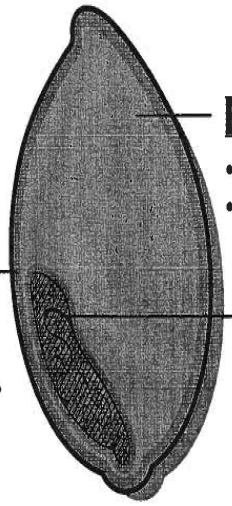
Especially if you're cutting calories, remember to keep your diet nutritious.

- 2–4 servings from the Milk Group for calcium
- 2–3 servings from the Meat Group for iron
- 3–5 servings from the Vegetable Group for vitamin A
- 2–4 servings from the Fruit Group for vitamin C
- 6–11 servings from the Grain Group for fiber

THE *Whole* GRAIN BONUS

THE GREAT NEWS ABOUT WHOLE GRAINS

Choose whole grain foods to get the nutritional benefits from the entire grain. Diets rich in whole grains and low in fat may help lower your risk for heart disease, some cancers, and diabetes.



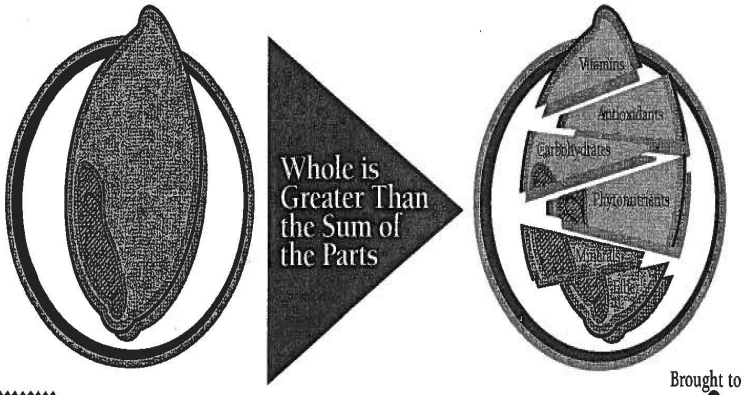
ENDOSPERM
- Provides energy
- Carbohydrates, protein

BRAN
- "Outer shell" protects seed
- Fiber, B vitamins, trace minerals

GERM
- Nourishment for the seed
- Antioxidants, vitamin E, B vitamins

BENEFITS COME FROM THE "*whole* FOOD"

With whole grains, the "whole" is truly greater than the sum of the parts. Individual nutrients in whole grain foods each offer important health benefits. Working together in the "whole" food, they perform in powerful ways to protect your health.



GO WITH THE GRAIN

GO FOR THE *whole* GRAIN!

Brought to you by General Mills

GENERAL MILLS BELL INSTITUTE OF HEALTH AND NUTRITION

(800) 328-1144
www.generalmills.com/wholegrain

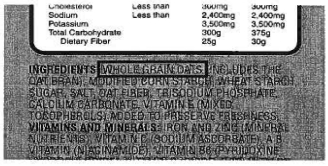
A32816

IN SEARCH OF A *Whole* GRAIN

Finding whole grain foods is easy, once you know what to look for. Discover whole grain foods in your supermarket with these quick tips.

SCAN THE INGREDIENT LIST

Whole grain foods will list a whole grain–such as wheat, oats, corn, or rice–as the first ingredient. You'll know it's whole grain if the words "whole" or "whole grain" appear before the grain's name in the ingredient list.

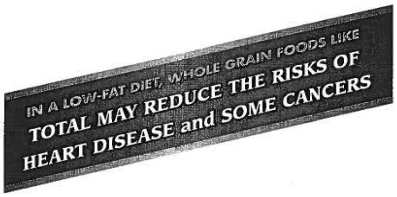


LOOK FOR THE WHOLE GRAIN SEAL

Some food manufacturers are making it even easier. Whole grain foods from General Mills are stamped with this seal.

TAKE NOTE OF THE HEALTH STATEMENT

This government-authorized statement points out the connection between whole grain foods and health. Whole grain foods that meet certain requirements can carry this message. Look for it on a product's label.



DIETS RICH IN *whole* GRAIN FOODS AND OTHER PLANT FOODS THAT ARE LOW IN TOTAL FAT, SATURATED FAT, AND CHOLESTEROL MAY REDUCE THE RISKS OF HEART DISEASE AND CERTAIN CANCERS.

5-A-Day

Make a point to include fruits and/or vegetables in all your meals and snacks Try new varieties and find the ones that you like best. To make sure you are getting a good variety of nutrients, try to follow a few guidelines:

- Include at least one dark green or yellow fruit or vegetable everyday -- spinach, green leaf lettuce, squash, bell peppers, apricots, peaches, cantaloupe, mangos.
- Eat a citrus fruit at least once a day -- orange, grapefruit, tangerine.
- Eat an antioxidant-packed cruciferous veggie at least a few times a week -- broccoli, cauliflower, Brussels sprouts, or red/green cabbage.
- Cook with onions and garlic.
- Have tomatoes, raw or cooked, at least a few times a week.
- In general, eat more apples, blueberries, bananas, strawberries, plums, pears, grapes, and cherries.
- When you 're doing your shopping this week, be adventurous and toss a new variety of fruit or vegetable into you cart. You never know, you may find a new favorite. Everyone knows we're supposed to eat five servings of fruits and vegetables a day, but most of us have no idea how to make it happen on a consistent basis.

Try these tips for getting your five a day without thinking too hard:

- Slice up some fruit to sprinkle over cereal or pancakes at breakfast.
- Add sautéed peppers, onions and asparagus to an egg-white omelette.
- Spoon some fresh salsa over your favorite sandwich before adding the top slice of bread.
- Choose vegetable toppings, such as spinach or mushrooms, at the pizzeria.
- When your favorite fresh fruits aren't in season, snack on canned peaches, pears or fruit cocktail packed in juice, or dried apricots, apples or pineapple.
- Add grapes and sliced apples to chicken salad, or chopped bell peppers, red onion, and carrots to tuna salad.
- Buy ready-to-eat bagged veggies and salad greens or veggies from the salad bar.
- Add berries or bananas to yogurt for a sweet treat.
- Toss some fresh veggies into canned tomato sauce or soup.
- Snack on raw veggies with salsa.

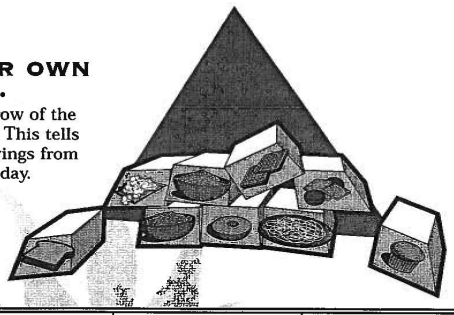
Tips to Retain Nutrients

- Buy vegetables that are as fresh as possible. When fresh is not possible, frozen is your next best bet. Avoid frozen vegetables that have added butter or sauces.
- Use well-washed peelings and outer leaves of vegetables whenever possible because of the high concentration of nutrients found within them.
- Store vegetables in air-tight containers in the refrigerator.
- Do not store vegetables in water -- too many vitamins will be lost.
- Cook vegetables on the highest heat possible, in the least amount of water possible, and for the shortest time possible. Steaming, microwaving, and stir-frying are the best cooking methods.
- Cook vegetables until tender crisp, not mushy. Overcooked vegetables lose their flavor along with their vitamins.

How Does Your Pyramid Stack Up?

Step 1: Build your own Personal Pyramid.

Look for the description in the top row of the chart below that best describes you. This tells you the approximate number of servings from each food group that you need each day.



Food Group	Children ages 2-6 Women Some older adults (about 1600 calories)	Older Children Teen girls Active women Most men (about 2200 calories)	Teen boys Active men (about 2800 calories)
Grains Whole Grains	6 3+	9 4+	11 5+
Vegetables	3	4	5
Fruits	2	3	4
Milk and Milk Products	2 or 3*	2 or 3*	2 or 3*
Meat and Meat Alternatives (dry beans, eggs, nuts)	2, for a total of 5 oz.	2, for a total of 6 oz.	3, for a total of 7 oz.

*Older children and teens (9 to 18 years) and adults over age 50 need three servings daily. Others need two servings daily. During pregnancy and lactation, the recommended number of milk group servings is the same as for non-pregnant women.

How Does Your Pyramid Stack Up?

Step 2: Recall what you ate yesterday.

Food or Beverage	Amount	Food Group	# of Servings

Step 3: Compare your portions to the Pyramid servings.

- Convert your portions to Pyramid servings. For example, 1 cup of pasta counts as two grain group servings; ½ cup of milk counts as one-half of a milk group serving.

Step 4: Total your servings from each food group.

- Compare your servings to your Personal Pyramid.

Step 5: How does your Pyramid stack up?

- Is the foundation of your Pyramid stable?
- Is your Pyramid top-heavy?
- Jot down a few changes you'd be able to make in your food choices.
- Remember, small changes can add up to big benefits--in how you feel, how you look, and your health for a lifetime.

GO WITH THE GRAIN

Brought to you by General Mills

General Mills Bell Institute of Health and Nutrition

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Minneapolis, MN 55426
(800) 328-1144
www.generalmills.com/wholegrain

A32815

Eat When You're Hungry, Stop When You're Full!

yes	no	DO YOU...
❑	❑	Believe there are good and bad foods?
❑	❑	Try not to eat foods that contain fat or that you think will make you fat?
❑	❑	Skip meals or diet to lose weight?
❑	❑	Eat foods only from certain food groups, such as fruits and vegetables?

☺ ***Here is a simple rule! Eat when you are hungry and stop when you are full!*** Eat many different foods. There are no "bad" foods.

☺ ***It's not good for you to diet, skip meals or avoid eating entire groups of foods.*** If you don't eat a lot of different kinds of foods, you may not feel well and could make yourself sick. Skipping meals can make you so hungry that you may eat too much food when you finally have a meal or snack.

☺ ***Fat makes foods taste good and helps you feel full.*** You may find you get hungry faster and want to eat more often if you eat mostly non-fat foods. Eating only foods labeled as "low-fat" or "non-fat" does not always mean you are eating well.

Here's what you can do to eat better!

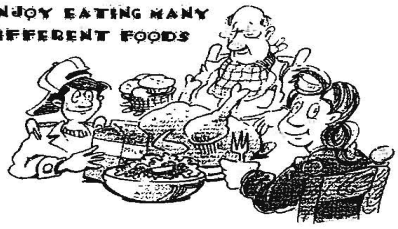
Put a check by all the things you will try.
Tell a friend, or your mom or dad, what you plan to do.

❑ ***I will listen to my body and eat when I'm hungry and stop when I'm full.***

❑ ***I will eat regularly.*** I will start off my day with breakfast and try to eat 3 meals a day, plus some nutritious snacks.

❑ ***I will try to eat many different foods from all the food groups,*** including milk, cheese, fruits, vegetables, breads, cereals, rice, pasta, meats, beans and nuts. I'll even treat myself to sweets and desserts sometimes.

Enjoy Eating Many Different Foods



yes	no	DO YOU...
❑	❑	Avoid foods even though they taste good and are good for you?
❑	❑	Eat any of your meals or snacks alone so that no one will see how little or how much you eat?
❑	❑	Get upset, scared or feel guilty about eating certain foods?

Eating should be fun! It's OK to eat!

☺ ***Good tasting food is easy to enjoy!*** Eat with your family or friends instead of eating alone. You can laugh and talk about your day, how you feel and you'll eat better too! Try some new foods you've never tasted.

☺ ***Don't feel guilty about eating!*** It's OK to eat for many different reasons: when you're hungry, or celebrating a birthday, holiday or family gathering, or having dinner at a friend's house.

Here are some things you can do to enjoy eating and feel better about yourself!

Check off what you will try.

❑ ***I will eat with my family and friends more often.***

❑ ***Whether I feel sad, lonely, upset or happy, if I'm not really hungry, I'll find something else to do instead of eating.***

❑ ***Being thinner doesn't mean being happier or healthier.*** If I hear someone say they are too fat and need to diet, I'll tell them they look OK the way they are. I'll encourage them to eat well and be active.

Meals on the Run

So busy you don't even have time to cook? No problem. Here are some easy meals that are fast and healthy.

Breakfast: Yes, it is still the most important meal of the day. Breakfast fuels both your brain and body, and skipping it can be detrimental to your work performance. If you've got no time to cook, try these grab 'n' go ideas. Most can even be eaten in the car:

- Bananas, apples or grapes
- Bagel with peanut butter or light cream cheese
- Low-fat yogurt
- Canned commercial supplements, such as Slim Fast, Carnation Instant Breakfast, Boost and Ensure
- Low-fat Pop-Tart
- PowerBar or Clif Bar
- Granola or fruit 'n' cereal bar
- Yogurt and fruit shake (Mix in a blender one cup of plain or vanilla yogurt, a few frozen berries and a dash of vanilla.)

Lunch: So packing your lunch isn't that cool. Who cares? It's less expensive and healthier in the long run:

- Tuna or chicken salad in a whole wheat pita (add some tomato and lettuce for color and fiber), a piece of seasonal fruit and a bag of baby carrots
- Peanut butter and jelly sandwich on whole wheat bread, fruit and a carton of 1 percent or skim milk
- Chef's salad (purchase a bag of already-mixed salad, lean lunch meat, low-fat cheddar or other cheese and some light dressing), a whole wheat roll and a piece of fruit
- Turkey or chicken breast sandwich with light mayo on a whole wheat bun or rye bread, a piece of fruit and a cup of yogurt
- Frozen meal (Healthy Choice or other brand) containing 10 or less grams of fat per serving, a piece of fruit and a carton of 1 percent or skim milk (microwave required)

Snacks: Of course you can snack. Just try to keep your snacks low-fat if possible. Skip the vending machine and try these:

- Fresh fruit
- Trail mix (mixed nuts, sunflower or other seeds, raisins)
- Baby carrots or celery sticks with low-fat dip
- Low-fat yogurt
- One-ounce bag of pretzels
- Bag of mixed cereal (corn, rice and bran chex)
- Cherry tomatoes, cut-up cucumbers or bell pepper rings with low-fat dip

"News You Can Use!"

Being a Healthy Eating Role Model

Parents are the most important influence in children's lives. Children watch and imitate adults, and look to them to learn proper behavior. Just as children pick up positive habits –saying please and thank you - they can also pick up attitudes about food.

As role models, parents need to monitor their own behavior so that their children acquire healthy attitudes toward eating.

Children learn by example

To get a sense of how your attitude might influence your children, examine your own behavior.

- Do you snack all day long?
- Do you eat in front of the TV?
- Do you eat whenever you are bored or under stress?
- Do you eat dessert at every meal?
- Do you skip breakfast?
- Do you have sodas rather than milk with your meals?
- Do you diet all the time and have a fear of food?

If you answered "yes" to more than a few of these questions, you are likely sending unhealthy messages to your child about food.

If you are eating poorly or skipping meals, your child is going to pick up on it. If you're anxious and unable to manage your own eating, you may pass that on to your child.

Establishing healthy habits can be very difficult for children who receive mixed messages. They won't perceive healthy eating as important if it is not something that they see you doing.

Positive and negative comments influence children's attitudes about foods. Remarks about guilt associated with eating certain foods or bemoaning the lack of time for meals will all be remembered by your child. What you **do** will make more of an impact than what you say.

Modeling healthy eating supports the development of healthy behaviors in children. And, there is no stronger message for the importance of healthy habits. For example, research shows that young girls are more likely to drink milk if their moms drink milk - milk contains calcium, an important nutrient for bone growth and development.

Modify Your Eating Habits

Even though you may now know WHAT to eat to achieve weight loss and a healthy lifestyle, some pesky eating habits may still be getting in your way. Here are a few pointers to help:

- Make it a point to eat breakfast and lunch. Skipping meals throughout the day will slow your metabolism and result in overeating in the evening, both leading to weight gain.

- Only eat when you are hungry. Learn to distinguish between being hungry and feeling tired, bored, depressed, stressed, thirsty, etc. If you are not sure if you are actually hungry, involve yourself in another task or activity. If you are still "hungry" later, have a snack.

- Do not wait until you are ravenous to eat. This is when overeating is likely to occur.

- In social situations (parties, holidays, dining out, etc.), focus on the occasion and friends and family—not food. Socializing and eating do not have to go hand-in-hand. Plan to meet with friends at the park or at the movies instead of over lunch.

- Use small plates when eating meals at home. You will be more likely to serve yourself smaller portions and your plate will still look full. Put any leftovers away before even sitting down at the table. You will be less tempted to go back for seconds.

- Before eating a meal, drink a full glass (8 ounces) of water. This will help you to feel full, eat less, and consume fewer calories at that meal. Also eating a large salad with low-fat or fat-free dressing before a meal will decrease the amount of higher calorie foods you will consume. *(You can add just a touch of full-fat dressing or vinegar and oil to fat-free or low-fat dressing to spice up the taste if needed.)

- Put down your fork between each bite to help you eat more slowly. The receptors in your stomach take 20 minutes to tell your brain that you are full (i.e. you are actually "full" 20 minutes before you realize it). Eating slowly will help you to decrease the amount of food consumed at each meal.

- Avoid the theory "I paid for it " or "I took the time to cook it, so I should eat it all". If you are full—STOP eating. Save the leftovers for lunch the next day, then you won't have to cook or pack a lunch. This can save money too.

- Do not eat anywhere but the kitchen or dining room table. This will help prevent you from munching on high-calorie, high-fat junk foods while watching television and subconsciously grazing while doing activities around the house or while preparing the meal. When you are finished eating your meal, leave the kitchen.

- To avoid late-night munching, clean the kitchen after dinner and shut the lights off. Tell yourself the kitchen is "closed" until morning.

- Do not keep sodas or snack foods in the house. If there's no junk food in the house, you can't eat it -- it's as easy as that!

- Always shop with a grocery list and only buy the foods on your list. Do not buy foods just because they are on sale unless they are on you list.

- Each day write down the foods you eat in your Food Diary. You will eventually see patterns in your eating behaviors and you will be better prepared to avoid the situations that cause you to stray from your plan.

- Avoid the "all or nothing" attitude (i.e. "I already messed up and ate some cookies so I might as well just eat 10 more"). Remember, energy (calorie) intake is cumulative. Once you start overeating, the more excess energy you consume, the more weight you will gain. If you stop as soon as you realize you have eaten too much, you will minimize the impact on your present weight.

- If you have a craving for a particular food that just won't quit, eat it and enjoy! Otherwise it is likely to consume your mind all day. Just remember to eat a small portion (ex: if you crave chocolate, eat a Hershey kiss or share a candy bar with friends).

- Make a list of any new goals that you will set for yourself based on the above suggestions (actually write them out and put them on the refrigerator. Try only one at first and slowly add to the list as you conquer your first goal. Remember, these changes are to last you a lifetime.

Being overweight is only a symptom. In order to eliminate the symptom you must address the cause (overeating and/or not exercising). If you focus on living a healthy lifestyle, weight loss will undoubtedly occur secondary to your improved habits.

Are You at a Healthy Weight?

The National Heart, Lung, and Blood Institute's guidelines say that to have the best picture of your weight, you should check three key measures:

- Your body mass index (BMI)
- Your waist size
- Your risk factors for diseases and conditions associated with obesity

The BMI combines your weight and your height. Waist size measures your abdominal fat. Add these to your additional risk factors, and you'll get a good idea of your risk for developing illnesses which are associated with extra weight. What is your risk?

Body Mass Index Table

To use the table, find your height in the left-hand column labeled *Height.* Move across that row to your weight. The number at the top of the column is your BMI at that height and weight. Pounds have been rounded off.

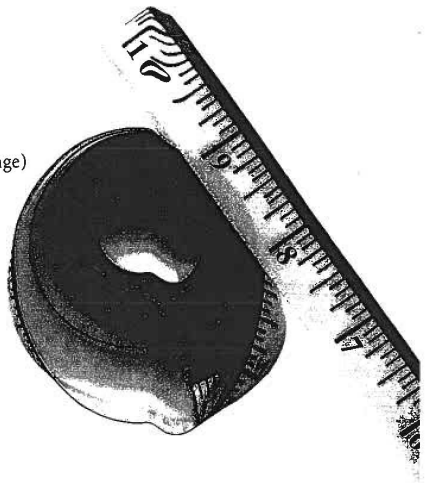
BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Height (inches)	Body Weight (pounds)																
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287

Source: National Heart, Lung, and Blood Institute

What the Numbers Mean

Here is what your BMI score means:

Less than 18.5	Underweight
18.5 - 24.9	Normal weight
25.0 - 29.9	Overweight (Your risk starts to go up here)
30.0 or more	Obese (Your risk increases a great deal in this range)



Waist Size

Place a measuring tape snugly around your waist to find your waist size. Your abdominal fat is another predictor of your risk for developing heart disease and other illnesses. Your risk increases with a waist measurement of more than 40 inches in men and more than 35 inches in women.

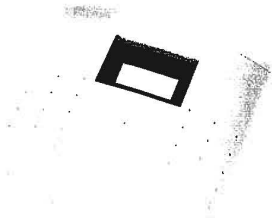
Other Risk Factors

Besides being overweight or obese, there are additional risk factors to consider.

- high blood pressure (hypertension – more than 130/80))
- high LDL-cholesterol ("lousy" cholesterol – more than 130)
- low HDL-cholesterol ("healthy" cholesterol - lower than 35)
- high triglycerides (another part of your blood lipids, or fat - higher than 150)
- high blood sugar (pre-diabetes, or actual diabetes - higher than 110 fasting or 200 two hours after a meal)
- family history of heart attacks, angina, and heart failure
- lack of physical inactivity (you need at least 20-30 minutes at least 3 times a week)
- cigarette smoking

What should I do?

People who are considered obese (BMI greater than or equal to 30) or those who are overweight (BMI of 25 to 29.9) and have two or more risk factors should definitely lose weight. Even a small weight loss (just 10% of your current weight) will help to lower your risk of developing diseases associated with obesity. Those who are overweight, do not have a high waist measurement, and have less than 2 risk factors must prevent further weight gain.



Talk to your doctor to see if you are at an increased risk and what you should do about your weight. People who are overweight or obese have a greater chance of developing high blood pressure, high blood cholesterol, type 2 diabetes, heart disease, stroke, and certain cancers. Even a small weight loss (just 10 percent of your current weight) will help to lower your risk of developing those diseases.

Here is a chart to illustrate the sugar difference in several carbonated beverages.

Sugar Content in Selected Carbonated Beverages* (per 12 ounces)

	Carbohydrate (g)	Teaspoons Sugar
Cola	39	10
Dr. Pepper	40	10
Ginger Ale	32	8
Orange	46	12
Pepsi	41	10
Root Beer	39	10
Seven-Up	26	6.5
Tonic Water	35	9

Many soft drinks contain caffeine or a similar stimulant. Here is a comparison of the caffeine content in beverages frequently consumed with meals.

Caffeine Content of Beverages*

	Caffeine Content(mg)
Coffee (6 oz. cup)	
Brewed, drip method	103
Decaffeinated, brewed	3
Instant (1 rounded teaspoon)	57
Tea (6 oz. cup)	
Brewed, black, 3 minutes	36
Instant (1 teaspoon)	30
Soft Drinks (12 fl. oz. serving)	
Coca-Cola Classic	47
Cola	37
Diet Coke	47
Diet Rite Cola	48
Mellow Yello	53
Mountain Dew	55
Mr. Pibb	41
Pepper-type	37
Pepsi	37
RC Cola	43
Tab	47

*Source: Pennington, J.A. *Bowes & Church's Food Values of Portions Commonly Used.* 17th ed. Lippincott, Philadelphia 1998.

Ten Super Foods You Should Eat!

1. Oranges

Great tasting and rich in vitamin C, folic acid and fiber.

2. Whole-Grain Bread

It's higher in fiber and about a dozen vitamins and minerals than enriched white bread or "wheat" bread. Look for whole- grain crackers, like Nabisco Triscuits.

3. Cantaloupe

A quarter of a delicious melon supplies as much vitamin A and C as most people need in an entire day.

4. Broccoli

Lots of vitamin C, carotenoids and folic acid.

5. Sweet Potatoes

A nutritional All-Star- one of the best vegetables you can eat. They are loaded with carotenoids, vitamin C, potassium and fiber. Mix in unsweetened applesauce or crushed pineapple for extra moisture and sweetness.

6. Fat-free (skim) or Low- Fat (1%) milk (not 2%)

Excellent source of calcium, vitamins and protein with little or no artery-clogging fat and cholesterol. (Enriched soy milk can have just as many nutrients- and it's cholesterol free.)

7. Beans

Inexpensive, low in fat and rich in protein, iron, folic acid and fiber. Choose garbanzo, pinto, black, Navy, kidney or lentils. Eat them as a side dish or snack in a tortilla with salsa or in a soup.

8. Salmon or other fatty fish

The omega-3 fats in fish, especially fatty fresh fish like salmon, swordfish and rainbow trout, can help educe the risk of sudden- death heart attacks.

9. Kellogg's All Bran Original or Post 100% Bran

A half cup serving of these cereals provides about one third of the fiber you

need for an entire day- to reduce the risk of constipation, diverticulosis and heart disease.

10. Spinach or Kale

Loaded with vitamin C, carotenoids, calcium and fiber. Kale is a good source of vitamin A.

Source: Nutrition Action Healthletter Nov 2001

A Super Food Recipe

Spinach and Red Pepper Crustless Quiche

2 large eggs
2 large egg whites
½ cup non-fat milk
1 pkg(10)ounces frozen chopped spinach, thawed and squeezed dry
½ cup fresh dill sprigs, chopped or ½ cup chopped scallions
1/4 tsp. ground pepper
2 slices reduced- fat Swiss cheese
1 medium red bell pepper, seeded, roasted or half 7oz. jar of roasted peppers, drained, cut into strips

Preheat oven to 375 degrees. Spray 8-inch square baking dish with cooking spray. In bowl, whisk together eggs, egg whites and milk. Stir well and pour into baking dish. Arrange cheese to cover spinach. Lay roasted pepper over cheese in one layer, pressing down gently so some of egg mixture flows up over cheese.

Bake until quiche is lightly puffed and browned on bottom, about 30 minutes. Run sharp knife around edges. Let stand 15 minutes before cutting into squares and serving. Makes 4 servings.

Calories: 108g, Carbs: 7g, Fat:4g, Fiber:3g, Protein:12g, Sodium:174mg

Think Your DRINK!

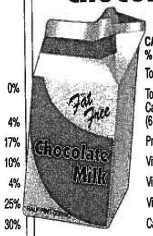
When it comes to NUTRITION, not all drinks are created equal! Which drink gives you the most *nutritious* "bang for your buck"?

FAT FREE MILK

CALORIES 90	% Daily Value
Total Fat	0%
Total Carbohydrates	4%
Protein	17%
Vitamin A	10%
Vitamin C	4%
Vitamin D	25%
Calcium	30%

Serving Size =1 cup $ .31

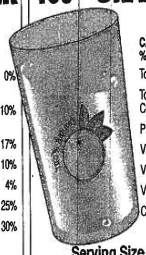
Fat Free CHOCOLATE MILK



CALORIES 150	% Daily Value
Total Fat	0%
Total Carbohydrates (6 tsp added sugar)	10%
Protein	17%
Vitamin A	10%
Vitamin C	4%
Vitamin D	25%
Calcium	30%

Serving Size = 1 cup $ .36

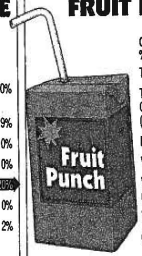
100% ORANGE JUICE



CALORIES 110	% Daily Value
Total Fat	0%
Total Carbohydrates	9%
Protein	0%
Vitamin A	0%
Vitamin C	120%
Vitamin D	0%
Calcium	2%

Serving Size = 1 cup $ .42

FRUIT PUNCH



CALORIES 120	% Daily Value
Total Fat	0%
Total Carbohydrates (7 tsp added sugar)	10%
Protein	0%
Vitamin A	0%
Vitamin C (fortified)	100%
Vitamin D	0%
Calcium	0%

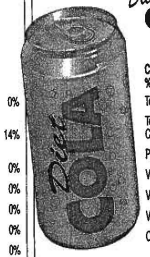
Serving Size = 6.75 ounce box $ .28

COLA

CALORIES 150	% Daily Value
Total Fat	0%
Total Carbohydrates (10 tsp added sugar)	14%
Protein	0%
Vitamin A	0%
Vitamin C	0%
Vitamin D	0%
Calcium	0%

Serving Size = 12 ounce can $ .47

Diet COLA



CALORIES 0	% Daily Value
Total Fat	0%
Total Carbohydrates	0%
Protein	0%
Vitamin A	0%
Vitamin C	0%
Vitamin D	0%
Calcium	0%

Serving Size = 12 ounce can $ .47

BOTTLED WATER

CALORIES 0	% Daily Value
Total Fat	0%
Total Carbohydrates	0%
Protein	0%
Vitamin A	0%
Vitamin C	0%
Vitamin D	0%
Calcium	0%

Serving Size =8 ounce $ .64

SPORTS DRINK

CALORIES 50	% Daily Value
Total Fat	0%
Total Carbohydrates (3.5 tsp added sugar)	5%
Protein	0%
Vitamin A	0%
Vitamin C	0%
Vitamin D	0%
Calcium	0%

Serving Size = 8 ounce $ .41

 % Daily values are based on a 2,000 calorie diet. (Grocery store prices, April 200

The Truth About Caffeine

Caffeine

Caffeine is a substance that exists naturally in plants. It is produced synthetically and used as an additive in food products. It is widely found in coffee, tea, chocolate, cocoa and many carbonated beverages such as colas.

Caffeine is often found as an additive in over-the-counter medications such as pain relievers, appetite suppressants, and cold medications.

Caffeine and Your Health

Excessive amounts of caffeine can lead to fast heart rate, diuresis (excessive urination), nausea and vomiting, restlessness, anxiety, depression, tremors, and difficulty sleeping. To decrease these side effects, caffeine should be ingested in low to moderate amounts. Three 8 oz cups of coffee (250 milligrams of caffeine) is considered moderate.

When considering eliminating caffeine from your diet one has to gradually reduce caffeine intake. An abrupt withdrawal of caffeine may cause headaches, drowsiness, irritability, nausea, vomiting and other symptoms.

Caffeine and Exercise

Caffeine has been known to enhance athletic performance for short periods of time. Habitual caffeine users tend to see less effect versus individuals who use it rarely.

Caffeine has a diuretic effect which enhances urine formation often causing the need to urinate within an hour after consumption. Thus caffeine is a poor choice for fluid replacement.

Source: The Physician and SportsMedicine - Vol 25 No 11- November 97

FOOD LOG

Meal/Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Breakfast							
Lunch							
Dinner							
Snack							
Feeling/ Emotions							

Curriculum Vitae

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Education:

Doctor of Philosophy – Public Health — Expected 2011
Walden University, Minneapolis, Minnesota

Master of Science – Public Health — 2008
Walden University, Minneapolis, Minnesota

Master of Science- Exercise Physiology — 1999
Howard University, Washington, DC

Bachelor of Science – Physical Education/Exercise Physiology — 1996
Howard University, Washington, DC

Relevant Professional Experience:

Wellness Programs Manager — 2007-2010
MGM Resorts International, Las Vegas, Nevada
Strategically planed all wellness programs for the Corporation for all domestic properties. Managed wellness vendor contracts. Managed on-site health educators and their programming. Provided guidance with RFP's for onsite clinics. Analyzed medical and pharmacy claims data to help determine wellness programming direction. Conducted continual program assessments and maintained statistical outcomes reporting for all programs. Implemented health awareness programs at the property level for employees. Assisted in developing new medical benefits programs. Assisted in project management of programs. Active participant in the MGM Resorts International Aviation Emergency Response Team.

Health & Wellness Coordinator — 2006-2007
Erin Collins & Associates, Kingman, Arizona
Manage and coordinates all wellness programs to include early detection/screenings and lifestyle modification programs for various county entities and American Indian tribes of Arizona. Analyzed medical and pharmacy data to help determine direction of the wellness program.

PFC Wellness Coordinator — 2000-2004
Providence Hospital, Washington, DC
Managed and coordinated the wellness programs for the Police and Fire clinics contract through Providence Hospital. Provided mobile on-site occupational immunizations and health screenings. Developed and implemented various health education/awareness programs to the Police and Fire clinics' population of Metropolitan Police Department, Fire Department, Uniformed division of United States Secret Service and United States Park Police. Also taught to this population various health education seminars. Supervised various clinical staff providing mobile services. Assisted at health fairs for fitness assessments, body fat analysis, and exercise demos for Corporate contracts held by Wellness Institute.

Other Experience:

Clinical Coordinator 2004-2006
Rankin Orthopaedic and Sports Medicine Center, Washington, DC
Practice manager for a group orthopedic practice. Maintained all credentialing for all surgeons . Functioned as the compliance officer for Medicare and HIPAA for the office. Processed payroll, supervised front office and radiology staff. Scheduled surgeries and obtained pre-certification when needed.

Admissions Representative 1999-2000
Providence Hospital, Washington, DC
Registered and admitted various patients to hospital based on doctor's orders. Verified and obtained insurance coverage and pre-certifications for certain procedures and services.

Surgical Scheduler/Office Assistant 1996-1998
Dr. Edward A. Rankin, Washington, DC
Scheduled patients for various orthopedic surgeries, answered and schedule doctor appointments, obtained insurance pre-certifications for surgeries, helped support office manager in office duties such as ordering supplies, typing dictated reports, provided basic patient education about various surgical procedures to those awaiting surgery.

Community Service:

Member, iDO Coalition, Las Vegas, Nevada 2008-2010
Southern Nevada Diabetes and Obesity Clinical Outcomes Coalition

Member, Partners for a Healthy Nevada (PHN) Coalition, Las Vegas, Nevada 2007-2010
Childhood Obesity Coalition with Southern Nevada Health District

Honors and Awards:

Manager with Momentum, MGM Resorts International, Las Vegas, Nevada 2008

Professional Affiliations:

Member, American Public Health Association

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