

**A Comparison of Diet and Exercise in Improving
Cholesterol Health among Firefighters**

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CERTIFICATION STATEMENT

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ABSTRACT

Over a five-month period, Forest Park Fire Department conducted research on improving employees' cholesterol health through fitness and proper diet plan. The problem was the lack of a structured physical fitness program to improve employees' health as they continued to age over the years. Forest Park witnessed employees lagging and unable to do their job due to their inability to stay fit. A neighboring department lost a member from cardiac related illness while on duty. The method used to gain the data was a pretest, posttest, and control group experimental design to answer the questions; Would a scheduled thirty-minute aerobic workout during the day improve the department's physical fitness, will cholesterol levels improve with a controlled diet, will cholesterol levels improve with fitness training and will physical fitness reduce the feeling of stress? The experiment included eighteen full-time employees separated into three groups of six candidates. Each group filled out a five question survey on their present stress level. In addition to the survey, a full lipid profile was collected. The research tested a controlled diet; shift one, and an exercise routine; shift two, to test the effect on how each reduced cholesterol and daily stress levels. Shift three was used as the research control.

The data showed that a controlled diet did reduce candidate's cholesterol. Some of the literature also reported the same findings (Jenkins 2003). The results from the exercise group data showed a small increase in cholesterol levels. The survey questions also showed an increase in candidate's stress levels. Additional research will provide further data on why this outcome came about.

With the data from this research and information gained from the literature, the department added a dietitian and nutritionist to the department training program on how to eat healthier.

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INTRODUCTION

Statement of the Problem

Today's fire service is demanding on one's mental and physical capabilities. The mental stress placed on firefighters is insurmountable at times. Firefighters help people in their direst needs. The loss of life, limb or property dwells on firefighters minds everyday. S. Ashbrock Fire Chief, Madeira Indian Hill Joint Fire District (personal communication October 20, 2004) stated:

When I first became a firefighter in 1978, we were called to an infant non-breather. When we arrived on the scene, the mother handed me the infant, who was not breathing. We took the infant, started CPR and transported to the hospital where the infant was pronounced dead. I can remember this detail as though it was yesterday. Picking up that infant is like picking up a lifeless doll.

Emergency runs like those that Chief Ashbrock speaks of that place a lot of stress on a firefighter. Critical Incident Stress Management teams were established to help firefighters in the times of mental crisis. A team of volunteers will listen to a firefighter in crisis. Just the opportunity to have someone listen to your problem can relieve a stressful event.

Firefighter's wellness was often discussed, but implementation of policies did not exist. According to the National Center for Health Statistics (NCHS), in the United States, 64% of adults 20 years of age or older are overweight or obese. Recent studies have confirmed the positive influence physical activity has on an individual's health. Regular physical activities have been associated with decrease obesity and a lower rate of disability.

The International Association of Fire Fighters (IAFF), International Association of Fire Chiefs (IAFC), National Volunteer Fire Council (NVFC), and the United States Fire Administration (USFA) developed programs or initiatives to promote firefighter health. These groups have recognized the importance of a wellness program, however, Tri-Data Corporation (2002) states, “the leading nature of fatal injuries cause to firefighters between the years of 1990 through 2000 was heart attacks” (p. 1). Wolf and Colditz (1998) reported, “nationally, overweight and obese employees cost their employers 3.9 billion dollars annually” (pp. 97-106).

This study investigated the measurable changes in cholesterol as a result of diet and exercise. Traditionally, firefighters spend the majority of their time preparing for a major event that happens once during their career. Preparing for such an event equates to pre-planning of properties, inspections, prevention education and training. The other part of a firefighter’s day consists of responding to emergency calls. It is difficult for a department to add additional cost to their budget for health and fitness programs. On an average, 80-90% of a fire department’s budget is for employees. Employees are the largest assets.

Purpose of the Study

The purpose of this study was to determine whether exercise and diet control while on duty would show a change in firefighters’ cholesterol levels, and reduce their frequency of stress causing factors. Fire department administrators can replicate this research to educate their employees on wellness and fitness.

Reviewing literature on health, wellness, and the findings of this study, implementation of new a policy was written for the department. Discussion of this study with the chief of the fire department, human resource director and the union leadership has created a better understanding on the direction of firefighters’ health.

Firefighters are not taught how to physically prepare themselves for their job. Fire department budgets are spent on how to do the job effectively, but physical fitness is a topic we expect everyone to know prior to hiring. NCHS stated, “64% of adults 20 years of age and older are overweight or obese.” This is usually the age group citizens are recruited into the fire service. Without the proper knowledge of fitness, injuries are on the horizon. Firefighters also lack the knowledge of a healthy diet. Eating fast food and snacking on high fat and sugar snacks all day is not a well-balanced meal. Usually a meal will come by way of a vending machine. The job of a firefighter places a large strain on the cardiovascular system. A proper diet and exercise routine can prepare the firefighter for future tasks.

Reviewing the data on this project, a new policy was implemented within the department. Firefighter’s wellness and health was a forefront issue. The study educated firefighters on a healthy diet and physical fitness can improve their health. The employee understood how cholesterol effects the cardiovascular system. Additionally annual physicals paid by the city for full and part time employees would prove fruitful. The fire service must change the mindset of not just getting everyone home safe after their shift, but also to get everyone to retirement to enjoy their later stages of life.

Research Questions

The following questions were answered by this survey and action research:

1. Will cholesterol levels improve with a controlled diet?
2. Would a scheduled thirty-minute aerobic workout during the day improve the department’s physical fitness?
3. Will cholesterol levels improve with fitness training?
4. Will physical fitness reduce the feeling of stress?

BACKGROUND AND SIGNIFICANCE

Forest Park, a planned community since its inception, is now the third largest city in Hamilton County, Ohio, with approximately 19,463 residents in 7,505 households within 6.3 square miles (2000 census). The city is located only 14 miles north of downtown Cincinnati, 35 miles south of Dayton, and within 125 miles of Columbus, Indianapolis, Louisville, and Lexington.

After the surge in economic growth following WWII, the Warner-Kanter Corporation set aside a portion of undeveloped land from neighboring Greenhills and began to plan and build this new city.

Forest Park incorporated itself as a Village in 1961 and achieved city status in 1968. Using a master plan to develop its 3,800-plus acres, Forest Park integrates commercial developments and high quality neighborhoods while leaving the surrounding greenbelt virtually undisturbed.

When Forest Park became a township a volunteer fire department was created. Twenty-four members contracted with the village to provide fire protection. At its conception the idea to put fires out was there, but mainly this was a clubhouse for the men.

The township became a city and the department has progressed to a fully functional fire department providing advance life support and multiple customer service projects. The demand placed on the employees has increased. They have special areas of responsibilities, which assisted the department's growth. The number of annual emergency details increased by 963 compared to 2001 data.

As the department's members began to age, there were no policies to keep the employees fit for duty. The budget would not allow annual physical assessments to be performed on the

employees. As the department's emergency details approached 3,700 per year, there were no hiding places for an aging employee within the organization.

This author had worked for a department where a firefighter died from coronary heart disease. That employee had just completed a training exercise while on duty. He was in his late thirties. Despite this incident, his department did not learn from their loss. What was learned through autopsy is that he died from several block coronary arteries. The coroner called it "Atherosclerosis." Atherosclerosis is a condition where fat and cholesterol builds up over time on the artery walls. According to the literature reviewed, exercise and/or a proper diet could have prevented this event.

Fitness and health was not placed in the forefront of many departments concerns. Tri-Data Corporation (2002) states "Forty-four percent of firefighter's death is contribute to heart attacks." A large portion of a fire department's budget is invested to educate and train the employees. The fitness and health of our employees must be a higher priority, because a department cannot replace a well-trained employee over night.

Loss of a firefighter to a cardiac episode or stroke due to health problems will cost a department both financially and emotionally. Employee's who survive such a medical event will create new expenditures for rehabilitation, loss of wages, overtime to cover their shifts and increases in the department's workers compensation and insurance premiums. When a life is lost, there will be multiple organizations looking into the department for ways the event could have been prevent. This alone could cost a department future legal expense.

The significance of this research was to determine if fitness programs established within the fire department can relief stress and reduce cholesterol. We know Based on the results of this research, employee's health and wellness will receive more attention.

LITERATURE REVIEW

Looking back at the research questions, many articles and research were found that correlated to fitness and health.

The first research question addressed by this study was, “*would a scheduled thirty minute workout during the day improve the department’s physical fitness?*” It has been stated through research that aerobic exercise for thirty minutes on some days will decrease the risk of coronary artery disease and related comorbid conditions (Drygas 2000).

According to Tri-Data Corporation’s research on the Firefighter Retrospective Study (2002), the leading cause of fatal injuries to firefighters is heart attack. Their study shows forty-four percent of fatalities over a ten year period were contributed to coronary heart disease.

High cholesterol levels are factors in coronary heart disease. Durstine and Haskell (1994) stated, “Regular participation in physical activity as well as a single exercise session can positively alter cholesterol metabolism.” Through their research, they found that exercise is involved in increasing the production and action of several enzymes that function to enhance the reverse cholesterol transport system. The main goal, through this research, was to reduce the chance of cardiac related illnesses. American College of Sports Medicine [ACSM] (1998) stated through their research, “Exercise prescription should begin with approximately twenty minutes of continuous aerobic exercise and may progress up to sixty minutes.” The optimal training frequency is three to five times per week (ACSM 1998).

The second question of this research was, “*will cholesterol improve with fitness training?*” Low density lipoproteins are the primary transporters of cholesterol. Low density lipoproteins are often called the “bad” cholesterol because their main function is to transport cholesterol to various body cells, including artery walls where low density lipoproteins release and deposit cholesterol. When low density lipoprotein levels are elevated, cholesterol begins to accumulate in vessel walls and restrict blood flow increasing the risk of heart disease. Lakka and Salomen (1992) study shows a favorable increase of high density lipoprotein levels with regular exercise. High density lipoproteins, “good cholesterol,” are involved in the reverse transport of low density lipoproteins from the arteries to be synthesized in the liver (Durstine & Haskell, 1994). It is believed that increasing the high density lipoproteins can prevent or reverse heart disease. Johnson and Kraus (2003) presented their research where a low amount of exercise at moderate intensity resulted in lower levels of “bad” cholesterol and an increase of the “good” cholesterol.

The third question for this research was “*will cholesterol improve with a controlled diet?*” According to Jenkins (2003) research, you can see the same therapeutic affects on a vegetarian diet compared to being on cholesterol controlling medicines. His research consisted of three groups: control, low-fat vegetarian diet and medication (statin). The low-fat vegetarian diet group was able to lower their cholesterol by eight percent compared to the medication group’s nine percent. This was done all in a four-week period. Since this research involved fellow employees, the low-fat vegetarian diet was selected for this research project. According to United States Fire Administration recommendations, a diet consisting of low fat, cholesterol, sodium, and calories can reduce the firefighters’ risk. American Heart Association (2005)

recommends eating a diet consisting of high fiber can reduce low density lipoproteins, which are the bad cholesterol, and increase the good cholesterol, high density lipoprotein.

The final research question was, “*will physical fitness reduce the feeling of stress?*”

Research has found that there are mental health benefits from exercise, including reduced stress and increased confidence for those who exercise regularly. Gilbert (2005) states:

Walking and physical activity (dancing, gardening, cycling, swimming, etc.) will reduce stress. Regular exercise and physical activity strengthens your immune system, cardiovascular system, heart, muscles and bones. It also stimulates the release of endorphins, improves mental functioning, concentration/attention and cognitive performance, and lowers cholesterol, blood pressure, cortisol and other stress hormones.

(Gilbert, 2005, ¶ 4)

Stoney (2002) states:

That short-term stress increases the bad form of cholesterol. When the body is placed under stress the blood clots more readily, muscles become tenser, and the immune system lacks strength, which contributes to health ailments. Through exercise, candidates can strengthen the cardiovascular system and improve the muscular system thus enhancing their ability to cope with stress and its bad side effects.

PROCEDURES

Action research accompanied with a survey was used to answer the research questions for this study.

There were three test groups with six full time employees. Their shift identification, Shift 1, 2, and 3, represented each group. Full time employees were selected because of their requirement to be at work for the same shifts. Candidates completed a five-question survey, developed by Florida State University Psychosocial Stress Research Program, which measures their subjective judgement of the frequency of factors that contribute to stress. The survey used a scale of one through five. The anchors were: 1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Frequently; 5 = Always. All surveys were returned prior to each candidate having their cholesterol screened. The questions were:

1. I have too much work to do and/or unreasonable deadlines.
2. I have difficulty exercising.
3. I tend to neglect my diet (eat irregular, eat unhealthy foods, etc.).
4. I rush through the day and have no time left to relax.
5. I feel tired/fatigued for no reason.

Each Candidate had their cholesterol screened at the beginning and completion of the research. A fasting period of twelve hours was required to get an accurate reading. Cholesterol screening will be checked with a clinically approved device, Cholestech L.D.X. With a finger stick, blood was drawn and a total cholesterol score was produced within five minutes. For the purpose of this research high-density lipoproteins, low-density lipoproteins, and total cholesterol were monitored.

Shift 1 had a controlled diet plan. The plan was basic and easy for the shift to follow. The

foods selected for the diet were dark green vegetables, bran cereals, beans, nuts and lean meats including chicken and pork. The only cooking methods allowed were boil, bake or grill. The meals were modeled after Jenkins (2003) research. The shift's cook prepared three meals per shift. Breakfast was a high fiber cereal with skim milk. For lunch, lean lunchmeat sandwiches on whole grain bread with low-fat chips. Dinners consisted of baked or grilled lean pork or chicken with vegetables. Condiments and seasonings were used at subjects discretion. They were restricted from fast food restaurants and snack foods. The only snack foods allowed were nuts and fruits. This shift was selected as the diet group because of their ability to cook meals on station instead of eating fast food. Maintaining all candidates on this diet plan was tedious at first but their taste buds adapted to the change. For the major part of this project, all were compliant to rules of their diet.

Shift 2's on duty crew had an American Council on Exercise [ACE] fitness trainer tailor a thirty-minute aerobic fitness routine for each candidate. Each employee had fifteen minutes on the treadmill and fifteen minutes on the weights. For research purpose only, a set thirty-minute period was allotted for their fitness. This shift was selected because of their lack of physical fitness. The ACE trainers spent an hour with all candidates of this group. They assessed their fitness level prior to allowing any type of fitness training. All candidates started their fitness routine with the treadmill. The pace was dependant on each candidate's ability to maintain a maximum heart rate according to ACSM (1998) recommendations of exercise intensity of 55-90 percent of maximal heart rate or 40-85 percent of heart rate reserve. The second part of their exercise routine involved circuit training. Circuit training involves moving from one exercise to the next with minimal rest, 30 seconds maximum, between sets. If rest cycle exceeds 30 seconds, some of the aerobic training benefits are lost. The exercise involved for this research were

squats, seated row, leg press, bench press, oblique crunches, calf press and barbell curls. For this circuit, ten repetitions were conducted at each station. After the third set, the workout was complete. The ACE trainer monitored for compliance.

Shift 3's on duty personnel continued with their regular routine without any disruptions. They had their cholesterol screened and completed the survey. Shift 3 was the control for this experiment. A control was established to see if there would be any change to challenge the data received on fitness and wellness.

Definition of Terms

Aerobic. Exercise involving a continuous and intensive exercise of the heart and lungs.

Enzymes. Any of numerous complex proteins that are produced by living cells and catalyze specific biochemical reactions at body temperatures (Merriam-Webster dictionary online)

Low density lipoprotein. The "bad" cholesterol. LDL's values below 130 are good (American Heart Association, 2005)

High density lipoprotein. The "good" cholesterol. HDL's values above 40 are good (American Heart Association, 2005)

Total cholesterol. Cholesterol is a soft, fat-like, waxy substance found in the bloodstream and in all your body's cells. Values below 200 represent a good value (American Heart Association, 2005)

Obese. Twenty percent or higher above the person's desirable body weight (Mosby Medical Dictionary, 4th edition)

Overweight. Ten to twenty percent above the person's desirable body weight. (Mosby Medical Dictionary, 4th edition)

Limitations of the Study

Working with a group of fulltime firefighters who worked every third day made it difficult to monitor their food consumed on their days off. This was a concern with Shift 1's personnel and the diet. Would the diet plan show any benefit eating a balance diet for one day and the days off eating other food that was not prescribed within the diet plan? In addition, with the diet crew, it was difficult to monitor the number of meals while out of the station. One way to resolve the controlled diet was to control their meals. A meal schedule could control the consumption of foods for each day. This would take the thought process out of thinking what to eat. Also, requiring the diet crew to fill out a journal of the foods they ate on and off duty.

On occasion Shift 2's workout was interrupted to make unscheduled emergency details. They still had the responsibility to the citizens and mutual agreements to provide the service the department pledged to deliver. Any interruption during their fitness routine reduced the effects of maintaining a target heart rate for thirty minutes. To resolve the issue of interruption of ones routine, the exercise program should start before or after the candidates shift. This will allow the candidate to maintain ones target pulse rate.

Because firefighters in the department talk to each other, a control group was near impossible to conduct. Shift 3, which showed an improvement in cholesterol, may have started to follow the other two shifts do to peer pressure. The team concept exhibited by firefighters is like a well-oiled machine. If one goes, we all go. No one wants to be left out of the game.

Several limitations that were not screened for were medications, alcohol use and a family. It was unknown if any candidate was using a cholesterol modifying medications. These medications could allow a greater change with an exercise or diet control program.

The American Liver Foundation states, “Some medications are harmful to the liver.” Most medications and cholesterol are metabolized in the liver. As we know, alcohol abuse damages the liver. If the liver were damaged, cholesterol would not be metabolized. This limitation can be overcome prior to future research by testing for liver enzymes to show how the liver is functioning.

Family history of heart disease, high cholesterol and hypertension were not recorded. These three medical issues hindered the progress of this research because of the reduced time devoted to receive data. Others who research the reduction of cholesterol had a year or more to collect their data.

The last limitation during the research was the time. The literature on both fitness and cholesterol reduction indicated research periods over a longer duration. This research had five months to implement and show improvements in the subjects’ subjective and objective health. Reviewing the literature, a one year period would prove a better comparison to the findings of others research.

RESULTS

The effectiveness of this research treatment was measured via objective and subjective criteria. The treatment phase of the research began on December 1, 2004 and ended on March 1, 2005. Participants completed their survey on their subjective feelings and a second testing of their cholesterol was conducted.

Research question, “Will cholesterol levels improve with diet control?” This was Shift 1’s responsibility in this research project. All candidates had some complaints with this project. The data from the diet treatment was comparable to Jenkins’ (2003) research. Diet alone did show an improvement in the candidate’s cholesterol. Figure 1 illustrates the group decreased average total cholesterol score by nine percent. Jenkins (2003) showed an eight percent drop in total cholesterol. As a group, the LDL was lowered while the HDL improved. During a four month period, Shift 1 improve their cholesterol health. This research project did replicate the findings of Jenkins (2003).

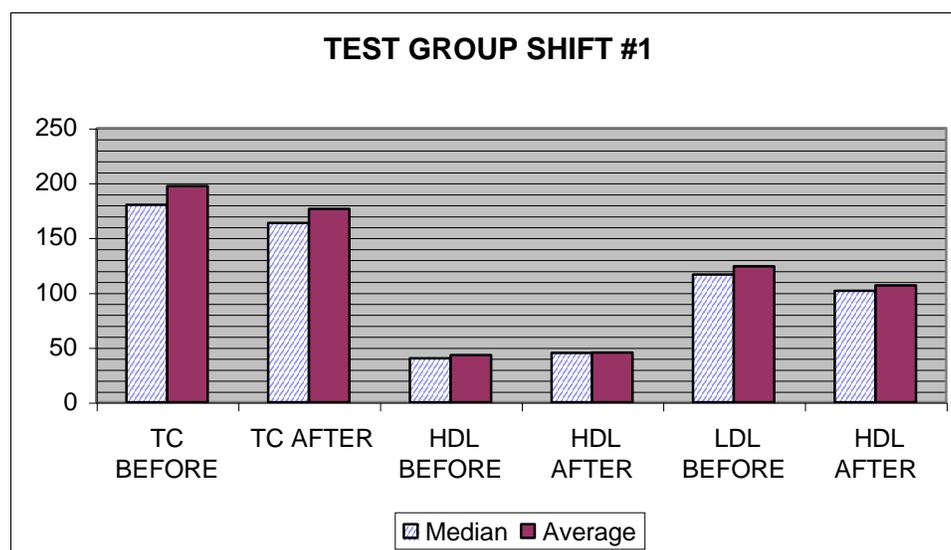


Figure 1. Shift 1’s before and after cholesterol values. Total cholesterol (TC), high density lipids (HDL) and low density lipids (LDL) were sampled.

The author looked at each candidate’s individual cholesterol before and after the research completion. With such an improvement on cholesterol health, it was needed to find that not one individual did not contribute to the findings in relationship to Jenkins findings. Appendix C shows the individual numbers for all three shifts cholesterol data. This appendix will also show the mean, range and standard deviation of all three shifts cholesterol before and after the research.

Shift 1’s survey response had some changes after the research was completed. Figure 2 illustrates these findings. Question #3 of the survey, I tend to neglect my diet, showed a small positive change. This finding could reference their daily change of diet while at work. Question #5 of the survey, I feel tired and fatigued for no reason, had a one point increase on their average response, meaning the test group was becoming fatigued compared to the beginning of this research. Further survey response and research is needed to narrow down the reason for these changes.

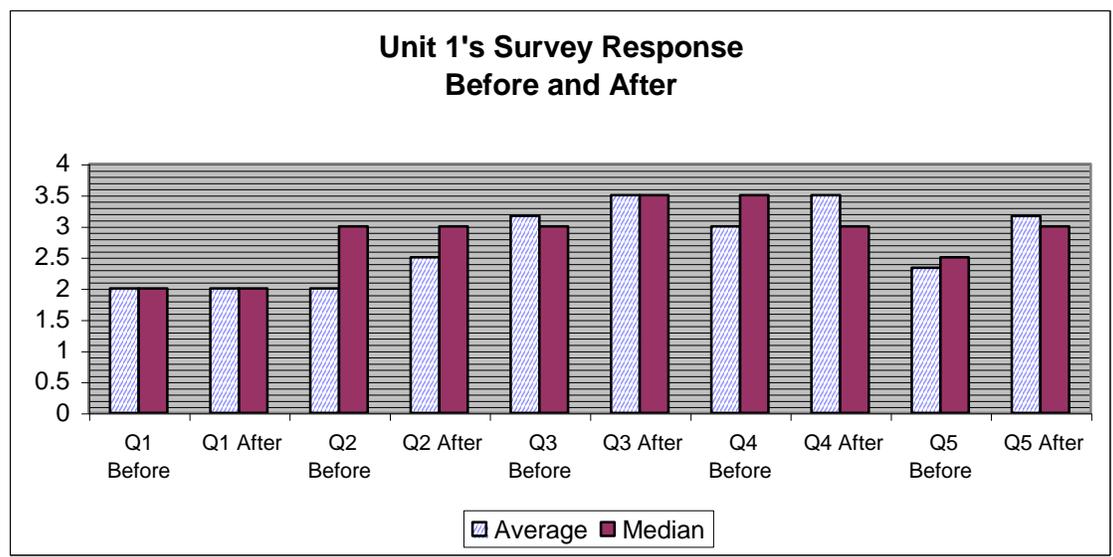


Figure 2. Shift 1’s subjective survey on their personal feelings before and after the research project. Questions for the survey are found in Appendix A.

The research questions, “Would a scheduled thirty minute workout during the day improve the department’s physical fitness?” and “Will cholesterol improve with fitness training?” were tested. This research found a different result compared to the literature reviewed. Durstine and Haskell’s (1994) stated regular participation in physical activity as well as a single exercise session could positively alter cholesterol metabolism. Exercise is involved in increasing the production and action of several enzymes that function to enhance the reverse cholesterol transport system (Durstine & Haskell, 1994). By following Durstine and Haskell’s (1994) research, this study found, on average, that exercise alone did not improve the candidate’s cholesterol levels. Figure 3 illustrates research findings on cholesterol for Shift 2.

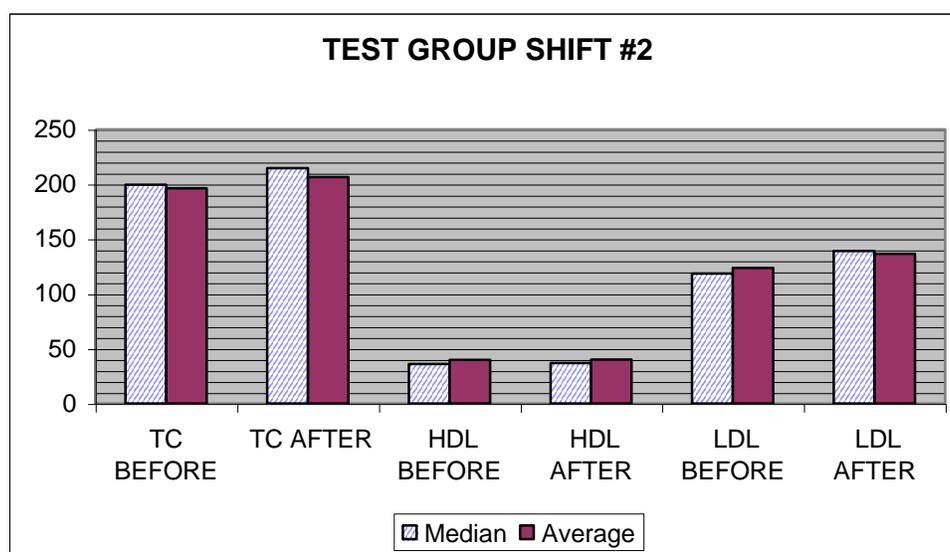


Figure 3. Shift 2’s before and after cholesterol values. Total cholesterol (TC), high density lipids (HDL) and low density lipids (LDL) were sampled.

According to Durstine and Haskell (1994), the study participants LDL and total cholesterol values should have decreased. Figure 3 shows, on average, a twelve point increase for LDL and ten point increase for total cholesterol. HDL, when increased, will reduce LDL within ones body. This research found a one point increase. Looking back at Durstine and

Haskell (1994), The response of HDL levels will differ for each individual depending on the intensity, duration and frequency of exercise, the initial HDL level, and the length of the training period. There may be an exercise threshold for exercise intensity, weekly amount of exercise, and length of the training period, that must be met before changes in HDL are evident. The way this research collected data was through group results, instead of individually results. This alone could have a significant change in meeting Durstine and Haskell's research.

Candidates subjectively reported, through the survey, that there, on average, were no changes in their personal perception of stress causing factors during the research period. Figure 4 shows subjective findings from the survey.

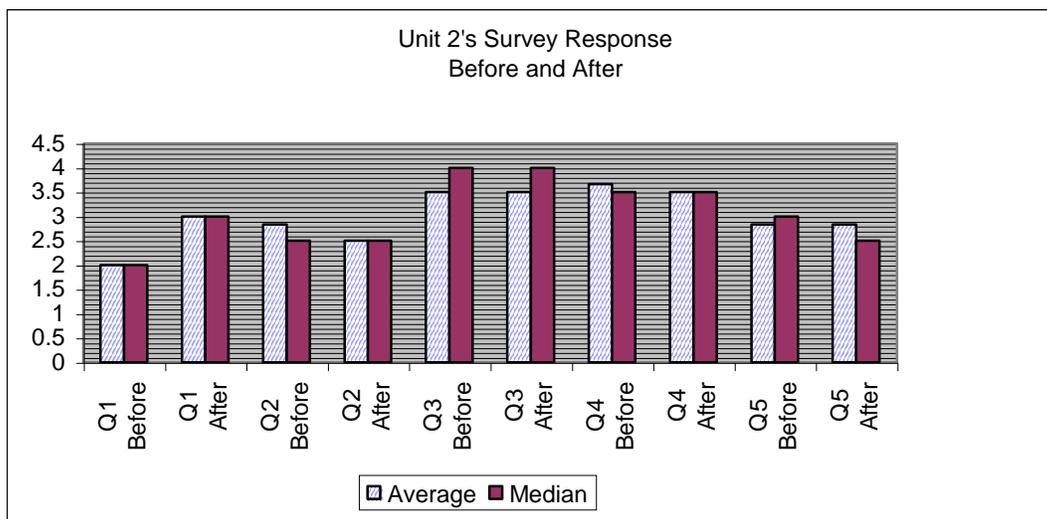


Figure 4. Shift 2's subjective survey on their personal feelings before and after the research project. Questions for the survey are found in Appendix A.

The control group showed changes from the start of the research to its conclusion. Figure 5 illustrates Shift 3's high density lipoproteins showed a slight improvement. The "bad" cholesterol, low density lipoprotein, showed a decrease in its value. The only explanation for these changes is Shift 3 started to follow the other shift's routines to improve their own cholesterol health. For future research, the control group should be secluded from the rest of the

experiment. More research and survey is needed to answer the unexpected change in their cholesterol.

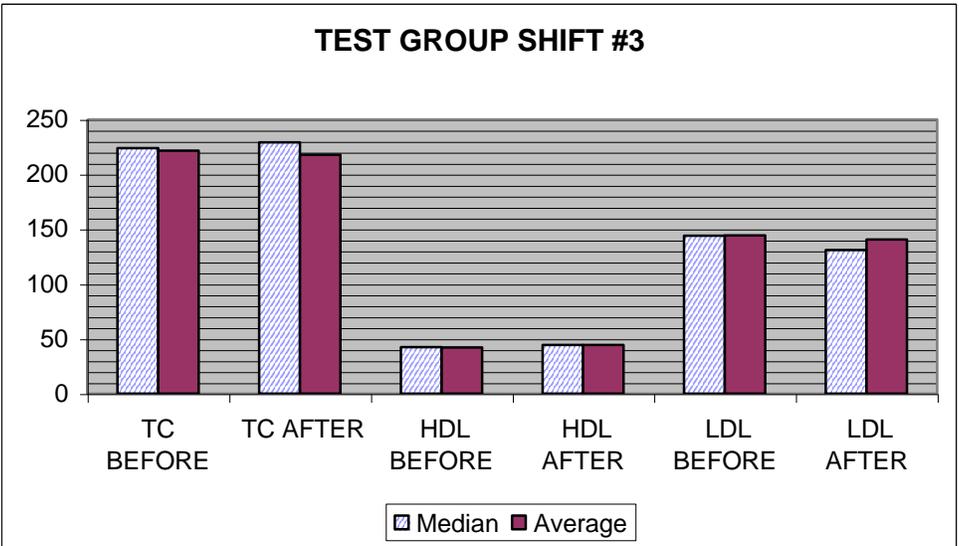


Figure 5. Shift 3's before and after cholesterol values. Total cholesterol (TC), high density lipids (HDL) and low density lipids (LDL) were sampled.

Figure 6 shows Shift 3's survey response during the controlled time period. There were no definite changes in their response scoring.

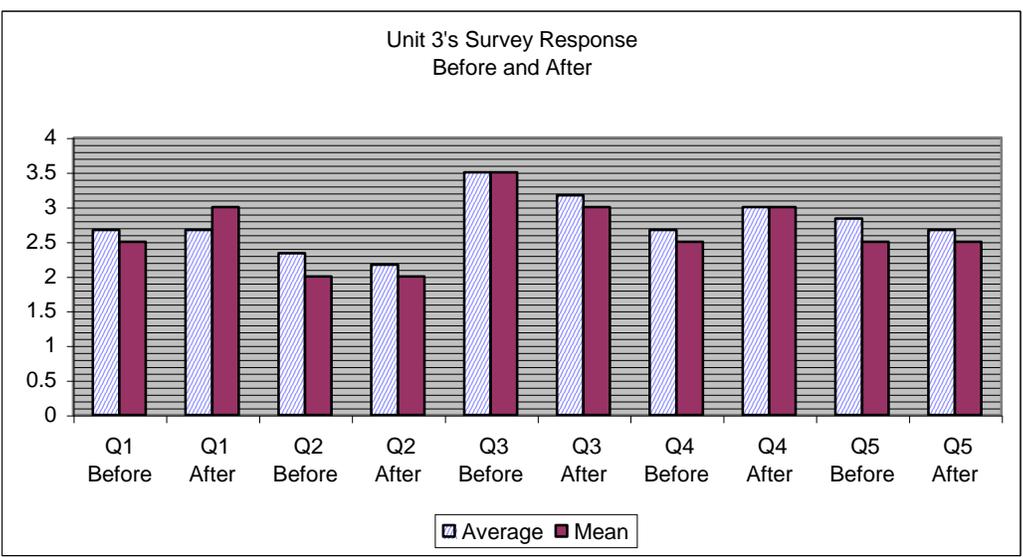


Figure 6. Shift 3's subjective survey on their personal feelings before and after the research project. Questions for the survey are found in Appendix A.

Based on the findings of this research, a fitness directive was implemented. All employees are required to meet the basic requirements set out in the directive shown as Appendix B. Replicating Jenkins research helped the department to enlist help from a nutritionist to teach our employees how to eat healthier.

DISCUSSION

Reviewing the two experiments and a control element, the author's understanding of diets and exercise has educated the members of the fire department on how one's health is an important issue. Eating healthy has showed that the candidate can improve their cholesterol health. Eating healthy does not mean being a vegetarian. The author believes combining a controlled diet in combination of a fitness routine; firefighters will be able to reduce their possibility of a negative cardiac event.

EXPERIMENT 1: DIET CONTROL TO REDUCE CHOLESTEROL

This experiment followed Jenkin's (2003) research on how a low-fat vegetarian diet reduces LDL's and improved HDL's cholesterol. This research was able to replicate Jenkin's low-fat vegetarian diet data. Jenkins and his research colleagues measured the cholesterol levels of 13 people who went on the combination diet for a month. The diet followed a seven-day plan using foods available in supermarkets and health food stores, including vegetables such as broccoli, carrots, red peppers, tomato, onions, cauliflower, okra and eggplant; oats, barley and psyllium; vegetable-based margarine; soy protein from products such as soy milk and soy sausages, cold cuts and burgers; and almonds, among other ingredients. A typical day on the diet might include a breakfast of soy milk, oat bran cereal with chopped fruit and almonds, oatmeal bread, margarine and jam; a lunch of soy cold cuts, oat bran bread, bean soup and fruit; and a stir fry dinner with vegetables, tofu, fruit and almonds. The study found that mixing these components together in a "combination diet" reduced levels of LDL cholesterol by eight percent. The finding suggests this combination diet may be as effective as the first generation of a class of drugs known as statins, which have been the standard drug therapy for high cholesterol for the last 15 years.

This study, candidates ate a similar low-fat vegetarian diet that reduced their cholesterol, on average, by eight percent. The data from this research were identical to Jenkin's eight percent drop in cholesterol. This positive finding encouraged the Forest Park Fire Department's administrative staff to bring a nutritionist on staff to teach all employees proper dieting.

EXPERIMENT 2: EXERCISE PROGRAM TO REDUCE CHOLESTEROL

This experiment followed Durstine and Haskell (1994) research on how exercise improved good cholesterol. Durstine and Haskell (1994) research showed an improvement of HDL and a lowering of LDL's within the bloodstream. This experiment was unable to produce the identical findings. Our participant's cholesterol, on average, actually increased.

A thirty minute exercise period was used, which allowed participants to work within their maximum heart rate. Durskins and Haskell's period started at thirty minutes. During their research period, exercise time increase to one hour. In addition, they worked out four to six days a week. This research had no real control over the time allowed for the candidates to work out. There were interruptions during their thirty minute time period and increasing the fitness routine to one hour would interfere with the employee's workday.

Durskin and Haskell (1994) had a pool of 117 candidates for their research project. The candidates were college students. A typical college student's age is in their late teens to early twenties. At this age metabolism is at its peak. College students have more free time available compared to a fulltime firefighter who also works several part time jobs on their off days. The average age for this study was thirty-four. The author believes that over a longer examination period with proper monitoring of our subjects our results would mirror Durstine and Haskell (1994) research. Durstine and Haskell (1994) experiment was for one year.

Reviewing the subjective data from the survey, one possible cause of the influx of stress to shift one personnel, is that, the department was involved in a ten million fire loss to a business. This fire happen toward the end of this research period.

Subjective findings on ones stress level had now true value to this research. Working as a firefighter is a stressful profession. To reduce stress, while on the job, was a difficult task. Literature does show that exercise will reduce stress but this research was unable to replicate such findings.

RECOMMENDATIONS

The findings from the controlled diet group, shift 1, were positive compared to other research data. The department should train each employee on proper diet and nutrition. This would teach each employee how to eat on and off duty. In the age of fast food, regularly, eating a well-balanced meal is difficult to fit into a busy schedule. Employees must take on the responsibility of their own fitness and health. When they choose to eat unhealthy, they need to add extra time in the gym to work off the extra calories.

Cholesterol monitoring should continue for all employees. When cholesterol levels were screened for each candidate, it was an eye opening event. The employees know the down side of having too much cholesterol in their systems. By monitoring cholesterol semiannually, this will help the employees work harder on their diet and fitness routines.

This study was unable to replicate Durstine and Haskell's (1994) findings. The author believes the interruptions of a firefighter, while on duty, are difficult to remove. Literature still shows that exercise helps reduce the risk of cardiac illnesses. The job of firefighters places a large demand on the cardiovascular system. Being public servants, firefighters must give the citizens the best service they are able to deliver. This means both a mentally and physically fit employee. With all employees maintaining their fitness, cardiovascular disease can be reduced as a risk for the employee. The author also believes, through literature reviewed, that a controlled diet, a fitness program with a longer evaluation period, the potential for the employees to show positive results should increase.

The use of the ACE fitness trainers should continue. Fitness trainers will make sure the fitness plan for each individual is being followed. Employees can go to the gym and sit during

their exercise time period. There is no benefit in sitting. Fitness trainers will be the motivators of the program.

Reducing stress while on the job is difficult to obtain while working. Presently, firefighters are taking medications to suppress anxiety and depression that is brought on by stress. The author believes that more research on reducing stress is required. Stress elevates blood pressures, which is contradicting to reducing cholesterol and improving firefighters health.

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APPENDIX A – STRESS LEVEL SURVEY

Evaluate Your Stress Level

This test will help you evaluate your stress level. It identifies some of the key causes of stress and allows you to identify which factors apply to you.

Instructions:

Rate each of the statements listed below on a scale of 1 to 5, where 1 is 'Never', and 5 is 'Always'. Put the appropriate number in the blank next to the statement, based on how you feel at this time.

Total up the points next to each statement to calculate your score.

1 - Never 2 - Rarely 3 - Sometimes 4 - Frequently 5 - Always

1. ___ I have too much work to do and/or unreasonable deadlines.
2. ___ I have difficulty exercising.
3. ___ I tend to neglect my diet (eat irregularly, eat unhealthy foods, etc.).
4. ___ I rush through the day and have no time left to relax.
5. ___ I feel tired/fatigued for no real reason.

APPENDIX B – FOREST PARK FIRE DEPARTMENT**Directive: #0305****Subject: Wellness and Fitness of the Firefighter/EMT/Paramedic**

It is the goal of this administration that each employee of the City of Forest Park Fire Department is able to perform and meet the requirements of the duties of firefighting and emergency medical assistance in a safe and healthy manner. The Health and Well-being of all personnel affects all aspects of the City of Forest Park Fire Department. Therefore, it is the intent of this directive to give all employees, including fire department administration many opportunities for fitness and wellness during their regularly scheduled shift duty and to encourage maintaining fitness and wellness during off duty. It is anticipated that the Firefighter/EMT/Paramedic will maintain a minimal level of physical fitness, which will be established by the fitness committee appointed by the Fire Chief.

PURPOSE:

- Maintain physically fit personnel
- Reduce job-incurred illness, injuries, and disabilities
- Establish fitness baseline records
- Establish and maintain entry level physical standards based on the Forest Park CPAT.
- Develop safety consciousness in a fit emergency response force
- Promote high morale

1. All personnel (full and part time) who engage in firefighting and emergency medical services must make every effort to maintain their physical fitness. It is the complete and absolute responsibility of each employee to maintain his or her own physical fitness.
2. At no time, will the Fire Department pay regular wages or overtime for fitness training unless approved by the Fire Chief.
3. The Captain/Lieutenant is responsible for making sure that each employee is given ample time during the shift and to help each employee meet the requirements of this directive.
4. Our trained staff, prior to participating in any fitness activities, will evaluate each employee. The fitness training equipment provided by the Department will be utilized for this evaluation.
5. A record of each time the employee participates in fitness training will be kept in the Firehouse Software.
6. This record of each employee will be reported to the Assistant Chief in charge of personnel.
7. By January 1, 2006, all personnel will be enrolled in the fitness program. July and December of each year will be the month for evaluation for each employee.
8. The improvement goal, which is set by the fitness committee and the employee, must be attained by each evaluation period.
9. The evaluation will show improvement. If there is no compliance with this directive and there is no improvement within the time period, the employee will be sent for 'fit for duty' evaluation.

The Standard Operating Guideline shall take effect immediately and shall remain in effect until superseded.

Trish Brooks, Fire Chief

APPENDIX C – INDIVIDUAL TEST RESULTS

TEST GROUP UNIT #1

Candidates	TC	TC	HDL	HDL	LDL	LDL
1	150	140	54	57	76	63
2	177	146	40	38	113	82
3	218	204	40	54	166	139
4	307	241	31	34	205	158
5	183	176	36	37	120	121
6	148	151	57	52	64	77
Median	180	164	40	45	117	102
Average	197	176	43	45	124	107
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER

TEST GROUP UNIT #2

Candidates	TC	TC	HDL	HDL	LDL	LDL
1	229	222	32	31	134	138
2	158	216	37	39	86	146
3	211	179	35	34	132	107
4	148	162	35	35	99	119
5	244	246	41	42	186	168
6	188	213	59	59	105	140
Median	200	215	36	37	119	139
Average	196	206	40	40	124	136
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER

TEST GROUP UNIT #3

Candidates	TC	TC	HDL	HDL	LDL	LDL
1	263	244	31	35	197	201
2	228	234	48	50	118	128
3	155	185	45	56	96	108
4	203	240	38	42	127	134
5	220	180	50	47	161	107
6	260	224	40	37	167	165
Median	224	229	43	45	144	131
Average	222	218	42	45	144	141
	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER

DESIRABLE READINGS
TC<200 HDL>40 LDL<130

