

A STUDY OF FIREFIGHTER FITNESS IN THE HIGH POINT FIRE DEPARTMENT

EXECUTIVE DEVELOPMENT

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ABSTRACT

Fitness and health have become a major issue for fire departments all across the United States. Firefighters need to be in fit condition due to the stress and physical nature of the job. Due to the physical demands of the job, fighting fires can be a life or death situation where in many cases the outcome depends on the physical condition of the firefighter.

The problem prompting this research project was that the High Point Fire Department does not have a physical fitness program causing the current fitness of firefighters to fall short of the level needed to operate efficiently and safely during suppression operations.

The purpose of this research project was to examine the potential for improving and maintaining the level of endurance of firefighters by developing a physical fitness program. An evaluative research method was used to answer the following questions

1. Why should a physical fitness program and fitness test be implemented at the High Point Fire Department?
2. What are the advantages of a physical fitness program and fitness test at the High Point Fire Department?
3. What type physical fitness program and fitness test would be the most beneficial for firefighters at the High Point Fire Department?

The procedures used to complete this research included a review of fire service publications, books and magazines, interviews with firefighters, surveys from numerous fire departments and consultation with an exercise physiologist.

This project indicated that physical fitness program and fitness tests were needed due to the results of the physical fitness test scores, injuries, heart-related problems, early retirement and performance at structure fires.

Recommendations included that a physical fitness program and fitness test be implemented at the High Point Fire Department. The physical fitness program would include cardiovascular endurance, muscular endurance, muscular strength and flexibility.

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INTRODUCTION

The High Point Fire Department is a fully paid fire department with 11 stations. There are 180 firefighters in the department, that work 24-hour shifts, equaling 10 days a month. The city covers 80 square miles and incorporates four counties, due to the vast amount of annexation in the last few years, some stations may be at the scene of a fire for up to 10 minutes before assistance arrives.

The U.S. Fire Administration (USFA) has produced studies stating that firefighting is one of the most physically and emotionally challenging occupations in the country. Every year, half of the nation's firefighters who die in the line of duty do so because of heart failure and other stress related illnesses. A more physically fit firefighter can reduce his or her chances of death in the line of duty by maintaining a healthy lifestyle and fitness program (Pearson, Hayford, and Royer, 1995). Firefighters need to be physically conditioned in order to meet the demands of the job they are expected to perform. Studies have shown that being fit directly relates to performance in this line of work and that physically fit firefighters are more efficient in their job. An article in *Firehouse* by Hayford, states that the most important piece of rescue equipment a firefighter has is his or her body (1996).

The problem prompting this research project was the High Point Fire Department does not have a physical fitness program causing the current fitness of firefighters to fall short of the level needed to operate efficiently and safely during suppression operations.

The purpose of this research project was to examine the potential for improving and maintaining the level of endurance of firefighters by developing a physical fitness program. This study was conducted because experience indicates that High Point firefighters tend to arrive at

the scene in a timely manner, yet fail to have the endurance needed to fight fires for long periods of time.

An evaluative research method, including surveys from various fire departments throughout the United States, interviews with firefighters, fire service publications, books and periodicals, a fitness test given to a group of firefighters to evaluate their level of fitness and consultation with an exercise physiologist, was used to answer the following questions

1. Why should physical fitness program and fitness test be implemented at the High Point Fire Department?
2. What are the advantages of a physical fitness program and fitness test at the High Point Fire Department?
3. What type physical fitness program and fitness test would be the most beneficial for firefighters at the High Point Fire Department?

BACKGROUND AND SIGNIFICANCE

The city of High Point is expanding in land area and economic development in such a vast movement that the fire department is unable to maintain the level of service the citizens have been accustomed to in the past. Growth is continuing with no new fire stations being constructed. The 1999 annual report documented 7079 total calls for the year, with 151 structure fires. This averages to one structure fire each working cycle per shift. Each cycle consists of 3 days working a 24 hour shift with a day off in between. Some stations have such a large area to cover due to new annexation that the companies may be at a scene for up to 10 minutes before additional fire companies arrive.

The High Point Fire Department has state of the art fire equipment, but this equipment is useless when the firefighters are too exhausted to use it. Extra fire companies are being dispatched to assist with fire calls. These companies are dispatched simply because the first responding companies are exhausted from the initial attack and their energy used up so that they can no longer perform at the needed capacity. This practice leaves more areas of High Point without adequate fire protection when extra fire companies are sent to a fire just for replacement of exhausted personnel. A method some Battalion Chiefs use to keep coverage of the city at the highest possible level is to send the fire companies who completed the suppression activities back to the station while fresh fire companies are sent to the fire scene to complete overhaul. If firefighters were in better physical condition, this practice would not be necessary and firefighters would be able to complete suppression operations more efficiently and safely. This is why a physical fitness program needs to be implemented at the High Point Fire Department.

In the past firefighters seemed to be more fit than they are today. Also in late 1980's the High Point Fire Department had a physical fitness test given once a year. At least then firefighters would try to get in shape for that test. That test has not been administered since then. This is why a fitness test needs to be implemented so that each person knows his or her level of fitness. A fitness program would keep the firefighters in shape so that they would score better on the fitness test when administered.

After consulting with Susan T. Swaim, Employee Benefit Supervisor of the City of High Point Human Resource Department, it was concluded that High Point Fire Department has always been plagued with numerous firefighters being out of work for extended periods of time. The injured firefighter would come back to work on light duty not being able to perform firefighting duties. These past and present injuries have caused stations to be short staffed and

fire apparatus to be taken out of service. Other firefighters were also called in to work on an off duty day which resulted in more money spent by the High Point Fire Department. If these firefighters had been in better shape, many of the injuries would not have occurred. A physical fitness program and fitness test would have reduced the number of injuries significantly and thus, the need to implement a program.

In the past five years, 35 firefighters have retired on disability from the High Point Fire Department. These injuries include 12 back injuries and 8 joint injuries. This number also includes 7 firefighters who retired with heart-related problems. (S. T. Swaim, personal communication, August 21, 2000). These injuries and heart-related problems can be directly attributed to the lack of physical fitness. Physical fitness also means cardiovascular fitness. As described by Ostrow, cardiovascular fitness enables the heart to work more efficiently without as much stress on the heart. This is very important when a firefighter has to get up in the middle of the night from a resting heart rate to one that might exceed 200 beats per minute (1997). A fitness program that would include cardiovascular endurance, muscular endurance, muscular strength and flexibility training would be ideal for the High Point Fire Department and would help reduce the number of early retirements and would save the department money and retain experienced personnel. Pearson et al. states that “Studies have repeatedly shown that firefighters and rescue workers need high levels of strength, endurance, aerobic capacity, and flexibility to do their jobs” (1995, p.1).

The High Point Fire Department has 11 stations with only two being equipped with exercise facilities. This is one reason a physical fitness program needs to be implemented in order to give all firefighters the opportunity to exercise on a regular schedule. A program should be implemented in order to give all fire companies the opportunity to exercise on a daily basis.

Firefighters hired today come from a generation of computers, cable television and video games. They are not as active and call in sick more frequently than firefighters did in the past. A physical fitness test and program would make firefighters healthier so that sick time would be reduced and would save the High Point Fire Department money. Future injuries would be reduced because firefighters would be more physically fit to handle their firefighter duties. If this trend of disability retirements and injuries continue, the High Point Fire Department will lose experienced firefighters and the costs paid in retirement monies will be tremendous leading to an inexperienced department.

The significance of this research project to the High Point Fire Department would be that a physical fitness test and physical fitness program would save the High Point Fire Department money, reduce job related injuries and retain experienced firefighters.

This research project was completed to meet the requirements of the Executive Development course of the National Fire Academy's Executive Fire Officer Program. This course was designed to help the participants become better leaders and take their departments into the future with new and better ideas. This project was researched and recommended that a physical fitness program be developed in order to make the High Point Fire Department a better organization for the future. Other fire departments would be able to use this project to enhance the physical fitness of their firefighters.

LITERATURE REVIEW

Need for A Physical Fitness Program

As described by Pearson et al., there are many reasons to have physical fitness standards for firefighters, one of which is mandated by the National Fire Protection Association Standard (NFPA 1500), *Standard on Fire Department Occupational Safety and Health Program*, which states “all fire departments shall provide and require the structured participation of all members in a program to develop and maintain appropriate levels of physical fitness” (1995, p. 7).

Despite the NFPA Standards not all Fire Departments have established physical fitness programs. The High Point Fire Department does not currently have an established physical fitness program and only two of the fire stations have physical fitness equipment available to the firefighters. In the late 1980’s there was a physical fitness test (Canadian Air Force Drill) required of all firefighters once a year, but no mandatory physical fitness program. This prompted some firefighters to run and exercise for a short period of time just prior to the test in order to try and pass the fitness test. Many firefighters failed to meet the minimum requirements in their age group, which prevented them from being promoted the next year.

Firefighters need to be in good shape to perform their duties. In an article by Pearson et al states that “Firefighting requires a physical performance profile reflecting high aerobic capacity, high muscular strength and endurance, above average lean body weight and minimal body fat” (1995, p.8). The extreme pace and rapid changes in the job require the firefighter to be physically fit in order to be able to successfully complete the job. A firefighter must get out of bed in the middle of the night from a sound sleep with a resting heart rate and minutes later be fully alert with heart pumping prepared to handle any type call from a false alarm, rescue call or a working structure fire. In an article by Ostrow he states that research has shown that

firefighters go from a resting heart rate of 60 beats per minute to as much as 180-200 beats per minute during strenuous activity. This change in heart rate can occur in a matter of minutes (1997).

Firefighters have to perform many physical tasks such as carrying and advancing hose, raising and climbing ladders, using axes and saws, lifting and carrying equipment, removing victims from danger and driving heavy fire trucks. All these are performed while firefighters are wearing turn out gear and airpaks, which make these tasks more difficult. Since the job is more difficult, firefighters need to be in better physical condition than the average person. There are other physical tasks a firefighter has to perform at their assigned station such as maintenance of the station and grounds. Pearson et al. states that these types of job tasks do not provide enough physical activity to keep the firefighter in shape (1995). “Studies show that merely performing the duties of a firefighter or rescue worker will not develop or maintain the fitness required for these occupations. Only a regular program of physical conditioning can accomplish this goal” (1995, p. 97).

Pearson et al. also reports the International Association of Fire Chiefs Foundation (IAFCF) and the International Association of Firefighters (IAFF) supports implemented fitness programs for firefighters (1995). Since these two organizations support fitness programs, one should be implemented at the High Point Fire Department. A physical fitness program would enable firefighters at the department to perform more efficiently.

In an article, *Are Firefighters Athletes?*, authors, McCrory and Goodson discuss whether firefighters should train as athletes. They state several components of fitness such as agility, balance, speed, coordination, power and reaction time. Firefighters need agility, which is the body’s ability to move quickly and precisely in situations. They may have to move quickly or

run out of the way of something falling. They also need balance, which is the body's ability to maintain equilibrium. Firefighters may have to climb ladders or get on top of buildings. Firefighters need speed, which is the body's ability to move quickly in a short amount of time. They may be working in the station and have to run quickly to his/her assigned truck in order to answer the fire call at hand. Firefighters need coordination, which is the body's ability to perform tasks with ease and proficiency. Coordination is needed to drive heavy trucks, climb ladders, carry heavy equipment and safely rescue victims. Power is another component that involves the body's ability to perform work with strength and accuracy. Firefighters need power to perform such strenuous duties such as lifting and raising ladders, carrying equipment. Reaction time is another component, which is the body's ability to react quickly. Firefighters must be able to change and react when the fires they are fighting quickly change requiring them to react quickly and safely. McCrory and Goodson contend that firefighters need to improve on all these components just as an athlete would prepare for an event. "But, the physical demands on a firefighter are really no different than those on an athlete. They must prepare to meet those demands during their training" (1996, p. 6).

The High Point Fire Department has state of the art equipment. Seven of the fire trucks are 1998 and 1999 models. There is very little out dated equipment. However, if a firefighter is not physically fit, the best equipment will not matter at a fire scene. Paul Davis, Ph.D., in *Fire Chief*, better states this when he writes, "Once on the scene, physical fitness plays a critical role. Without this very basic building block, nothing gets done. Technology can help, but it's still physical effort that will be required to get the job done expeditiously" (1994).

Reduction of Injuries

The City of High Point Human Resources Division documents firefighters had injuries such as sprains in the joints, including the back area and pulled muscles. The reason most firefighters are out of work is because of job related injuries. In the past five years, 35 firefighters have retired on disability. This number included 12 back injuries and 8 joint injuries. These joint injuries included knee and shoulder (S. Swaim, personal communication, August 21, 2000). “According to the National Fire Protection Association (NFPA) survey, strains, sprains and muscular pain accounting for over 40 percent of the 100,000 firefighter injuries in 1990. Over one fifth of all injuries were caused by overexertion or strain” (Pearson et al. 1995, p. 8). The High Point Fire Department seems to fall into this statistic. Injuries reported during the past three years document 46 sprains and strains with 100 days missed from work and 629 days on light duty. A fitness program would reduce these numbers as stated by Pearson et al. research shows a firefighter fitness program reduces the incidence and severity of job related injuries (1995). Pearson et al. adds “ Firefighting imposes significant physical demands, requiring high levels of fitness to minimize the risk of injury or even death” (1995, p. 9). In an article by Paul Davis, Ph.D., in *Fire Chief*, he writes that physical fitness programs reduce on the job injuries by one half and he believes a physical fitness program is the most effective means to reducing occupational injuries (1997).

Heart and Stress Related Problems

Out of the 35 firefighters who retired early on disability, 7 retired with heart-related problems. In *Comprehensive Wellness for Firefighters*, Pearson et al. writes, “...the fatality rate for career firefighters is one of the highest in all industries. Heart attacks are responsible for

about 50 percent of firefighter deaths. In 1990, 760 firefighters suffered a heart attack or stroke on the job” (1995). Pearson et al. also writes, “In 1985, coronary heart disease (CHD) was the leading cause of early retirement among firefighters, second only to cancer as a cause of death” (1995). The general population does not have as great a risk of coronary heart disease as firefighters who have 2 to 10 times more risk of heart related problems (Pearson et al., 1995). All jobs have stress, including ones which require shift work, but none seem to compare to the stress on the firefighter’s body especially when they have to get up from a dead sleep and put on turn out gear and airpaks to answer a call. Pearson et al. adds, “Studies have shown that firefighting requires working at near maximal heart rates for prolonged periods of time, often after limited warm –up. Heavy protective equipment and heat from the fire contribute to this physical load” (1995). As stated earlier, the heart rate rises tremendously when a firefighter has to get up from sleeping. This puts added stress on the body, especially the heart. The heart is a muscle and needs to have exercise just like any other muscle in the body. In *Firehouse*, Asken, writes, “Well conditioned individuals have lower resting heart rates and blood pressures. Under stressful conditions, the efficiency and capacity of the heart is significantly increased” (1994, p. 113). This researcher is familiar with at least three firefighters having heart attacks while on duty. These heart attacks occurred after the firefighter had been asleep and had to get up to respond to a fire structure call. Due to this type of stress on the heart, a firefighter needs to be physically fit to perform his or her duties. This added fitness would help to diminish the effects on the body. If a firefighter is in good physical condition, the job will be less stressful and the heart related problems from the job should be reduced.

Turn out gear and airpak cause the firefighter to need more lung capacity. Asken also writes, “Individuals who engage in regular exercise increase the power of their respiratory

muscles. This produces deeper inspirations per breath” (1994). Persons not in good physical condition succumb to exhaustion at a more rapid rate (Askens, 1994). A firefighter wearing turn out gear and an airpak who is not in good physical condition adds to the stress on the body. The airpak already inhibits the air flow making breathing more difficult. If a firefighter is not in good physical condition, just breathing with the added equipment is more difficult. The body will try to keep up and thus make the heart and lungs work harder causing the firefighter to tire much more quickly than a physically fit person. Cardiovascular fitness is an essential part of any physical fitness program. Pearson et al. states:

Studies show that this type of work requires high levels of cardiovascular fitness. This critical component of health and performance measures the ability of your heart and lungs to supply working muscles with oxygen, and your muscles’ ability to use that oxygen to produce energy. Thus, your cardiovascular fitness largely determines your ability to participate in vigorous physical activities for extended periods of time (1995, p. 92).

Pearson states that firefighters wearing turn out gear and airpak are exposed to extreme heat. “Protective gear impedes efficient heat dissipation, resulting in increased body temperatures. Effective cardiovascular functioning is necessary to dissipate this heat” (1995, p. 93).

The national annual accounting of firefighter deaths by the NFPA confirms that firefighters are dying from heart-related problems more than from any other occupational hazard. In 1995, for example, the largest proportion of deaths—47.4 percent or 42 of 95 deaths—was due to heart attacks. Forty-one of these 42 deaths were attributed to stress or overexertion. In fact, in almost every year since 1977, the leading cause of fatal injury among firefighters has been stress, with heart attack typically the leading nature of injury

and accounting for approximately half of the total firefighter deaths annually (Ostrow, 1997, p. 86).

A fitness program would help the firefighters get into shape in order to prevent the statistics from rising. Lori Hodgkinson in her article entitled, *Gear up for F.D. Fitness* writes:

The IAFF and the IAFC have teamed up to create *The Fire Service Joint Labor Management Wellness/Fitness Initiative* because they have learned that research has repeatedly shown the need for high levels of fitness to perform safely in the fire service. They state that the firefighters long hours, shift work, sporadic high intensity work, strong emotional involvement and exposure to human suffering places firefighting amongst the most stressful occupation in the world (August 2000, p.1).

Stress causes many physical and psychological problems. A person under a lot of stress or in a stressful job may experience these physical effects of stress on the body such as exhaustion, injuries, heart problems, high blood pressure and become more susceptible to illness. Some psychological problems are depression, tension and anxiety. Stress is one component of firefighting and exercise can reduce the effects stress has on the body and mind (Asken, 1994). Hodgkinson also states, "Fitness programs have long been credited with decreasing the risk factors associated with heart disease and hypertension. Heart disease is one of the leading causes or premature departure from the fire service" (August 2000, p. 1).

Advantages of a Fitness Program

There are many advantages to having a fitness program and fitness test implemented at the High Point Fire Department. One advantage would be firefighters would feel better and be in better physical condition to perform their firefighting duties. There would be less on the job injuries since firefighters would be less susceptible to them if in better physical condition. In an

article by Pearson he states that “Several fire departments have documented that improved fitness results in significant cost savings through reduced incidence and severity of on-the-job injuries. Of particular note are reductions in back injuries and improvement in heart disease risk factors” (1995, p. 9). Since injuries and illness are reduced, this would save the High Point Fire department money since firefighters would not be out of work with as many on the job injuries and early retirements would be reduced. Physically fit firefighters would be able to perform their duties more safely and efficiently than those who are not in shape. Pearson et al. also states, “Other recognized benefits include improvements in member work performance, morale, and well-being” (1995. p. 7).

Another advantage of a physical fitness program would reduce heart and stress related problems since firefighters would be exercising to strengthen their heart and lungs. A firefighter getting up in the middle of the night would be less likely to have a heart attack while performing his or her duties if physically fit. Fire related heart attack deaths would be lowered. Hodgkinson writes that “A physical fitness program is an effective weapon against such risks. Decreasing the risk can in turn save lives and also lower costs” (2000, p. 2). Furthermore Davis states:

Physical fitness programs would cause firefighters to be more fit.

“The more-fit firefighter will be capable of performing more work, with greater energy (functional) reserve than the less-fit one. The more-fit firefighter will be a safer firefighter, because of the greater reserve capacity in the event of any unforeseen contingencies” (1994, p. 18).

A physical fitness test would evaluate a firefighter’s level of fitness. The advantage to this would be that a firefighter would know their level of fitness and would know where they fell

short of the requirements. This would hopefully cause the firefighter to adjust his or her fitness program to reach the desired level of fitness.

Type of Program and Test

Paul Davis in *Fire Chief* states, “A department fitness program should be viewed as Employee assistance, aimed at general health, well-being and injury prevention” (1995, p. 23).

He also writes:

It took the American Association of Health, Physical Education, Recreation and Dance six years to agree on a definition of physical fitness. The result was identification of the following components: cardio-respiratory endurance, muscular strength and endurance, flexibility and body composition. To evaluate an individual, an appropriate test is administered for each component (1995. p. 23).

This would be the best type of fitness test to give to firefighters in order to evaluate their level of fitness. The researcher has chosen a Micro Fitness Test, which measures all of the above components. It will be discussed later.

The best type of physical fitness program would be one that includes cardiovascular endurance, muscular endurance, muscular strength and flexibility. “An effective cardiovascular exercise session takes from 30 to 45 minutes...” (Hayford, 1996). Hayford also states, “If you want to increase or maintain muscle flexibility, you must regularly stretch a muscle to the point where mild tension is developed...”(1996, p. 62). Cardiovascular fitness can be obtained by using an aerobic work out. A program should not just incorporate an aerobic workout, but

should also include weight training for muscular strength and endurance. Strong muscles protect joints, which keeps injuries to a minimum (Hayford, 1996). However, an aerobic or a cardiovascular workout should be a significant part of the program. Jack O'Connor in *Firefighter News* writes, "Aerobic fitness should be centerpiece of your fitness program because it has a strong relationship to both health and performance. Aerobic exercise also has a major role in weight control and thus directly affects two components of fitness "(1996). A fitness program that is continual is needed. Pearson contends "once you've developed a sufficient level of cardiovascular fitness, you must continue to follow a regular exercise program to maintain this level" (1995, p. 97).

PROCEDURES

This research project was prepared using the evaluative method. The research for this project began by obtaining literature from the Learning Resource Center at the National Emergency Training Center in May and June of 2000 through Interlibrary Loan. Information was also gathered from the University of North Carolina at Greensboro, Guilford Technical Community College in Jamestown and the High Point Fire Department Training Division library.

Personal interviews were conducted in April and May with firefighters at the High Point Fire Department with Mr. Dean Robertson, Exercise Physiologist at Guilford Technical Community College, Jamestown, North Carolina and with Ms. Susan Swaim, Employee Benefits Supervisor for the City of High Point. In April, a physical fitness survey was sent to 50 fire departments throughout the United States.

The literature review focused on the need for a physical fitness program to be implemented, which would improve firefighter performance, decrease injuries and early retirements.

Personal Interviews

A personal interview was conducted with an expert in the field of testing emergency personnel and firefighters using the Micro Fit Test. Mr. Dean Robertson agreed to assist with this project and test a random group of firefighters at High Point Fire Department. He is the area fitness consultant in law enforcement and is an instructor at Guilford Technical Community College. He tested 30 firefighters including 20 recruits using the Micro Fit Test. This test measures cardiovascular endurance, muscular strength, flexibility and body composition. The test was administered in the fitness lab at Guilford Technical Community College during the month of June.

Ms. Susan Swaim, Employee Benefits Supervisor for the City of High Point, also assisted with compiling data and statistics on firefighter injuries and disability retirements.

Physical Fitness Survey

A survey was conducted and sent to various departments in the United States. The survey was either e-mailed or faxed, except for local departments that were contacted by telephone. The departments were selected at random from the National Directory of Fire Chiefs and EMS Administrators. The survey was sent to 50 departments with 35 departments responding. The departments were grouped by size in categories of 200 or less, 201-500 and 500-up. The survey was designed to assess if a department has a program, if it was mandatory or

volunteer, how long the program has been implemented, if a decrease in injuries and sick leave has been noticeable, how long do the firefighters exercise daily, how the program is funded, are physicals given annually, has the department had assistance getting started, what type exercises are performed, is progress of the program documented, and what type department. When the department had no program implemented, only three questions needed to be answered. They included why does your department have no program, does your department plan to implement a program in the next two years, what type department, and what size department. These are shown in Appendix A.

Limitations and Concerns

The limitations for this project did not include all firefighters in the High Point Fire Department due to insufficient time to schedule firefighters for fitness test at Guilford Technical Community College. The scores included 20 recruits who range in age from 20 – 40, who were in recruit class exercising on a daily basis. An additional 10 firefighters who were assigned to shift work were also chosen to participate in the exercise. The scores were skewed because the majority of the data gathered were from recruits exercising on a daily basis and not shift personnel who have become stagnant in their current position. Based on observations made by the researcher, it is felt that the test scores will be much lower than the database used for this project. Tests for the entire department will not be administered until October, November and December 2000.

The survey did not meet the goal the researcher had intended to accomplish in reference to job related injuries or sick leave. Most departments did not retain the data or did not make an

attempt to get the statistics. The major reason departments do not have a program is due to the lack of funds.

Definition of Terms

Body Composition- -The ratio of the body's lean and fat tissues.

Cardiovascular Fitness- -The ability to participate in sustained vigorous physical activity for long periods of time.

Fitness- -The energy and physical ability to maintain a desirable quality of life-enthusiasm for living, without fatigue or exhaustion from routine required activities.

Flexibility- -The ability to move the joints of the body through their normal range of motion.

Health- -The absence of illness.

Muscular Endurance- -The ability of a muscle or group of muscles to generate force without fatiguing (multiple or sustained contractions).

Muscular Strength- -How much weight can be pushed or pulled.

RESULTS

The research and data gathered for this project indicated that a fitness program would benefit the firefighters at the High Point Fire Department. The Micro Fit Test administered by Mr. Dean Robertson revealed that the average fitness level of the firefighters tested ranked below the needed range to operate at a safe and efficient capacity as shown in Appendix B. Firefighter performance exhibited during suppression operations indicated that the data collected was accurate. The research gathered indicated that the demands and stresses of the job require a firefighter to be in the fit range or physical condition equal to that of a professional athlete.

Results gathered from literature and publications indicate that being in good physical condition reduces on the job injuries and lost time from work. Information gathered through personal consultation with the Employee Benefits Supervisor with the City of High Point indicated that the fire department had a high number of injuries and lost time from work during the past 3 years. The fire department has also had 35 disability retirements in the past 5 years with 7 of those due to heart-related problems. This is a direct correlation to poor physical condition.

Physical Fitness Survey

A survey was conducted and sent to various departments in the United States. The survey was either e-mailed or faxed, except for local departments that were contacted by telephone. The departments were selected at random from the National Directory of Fire Chiefs and EMS Administrators. The survey was sent to 50 departments and 35 departments responded. The survey indicated that the majority of departments do not place physical fitness as a top priority. As illustrated in Appendix I, only 10 departments have a mandatory program, 17 have an optional program and 8 have no program. The departments that had no program in place indicated cost as the main prohibiting factor. One volunteer department responded and they had no program. The remaining departments replying consisted of 21 paid and 13 combination.

Personal Consultation

An interview with Ms. Susan Swaim, Employee Benefits Supervisor with the City of High Point, indicated that we had a higher number of disability retirements and on the job

injuries with lost time from work than any other department in the City. Records from the past 5 years indicate that the High Point Fire Department had 35 retirements due to job-related disabilities. This number includes 12 back injuries, 8 joint injuries and 7 people retiring due to heart-related problems. In the past 3 years, data indicated there were 46 sprains and strains that occurred while fighting fires. The total numbers of days away from work resulting from these injuries were 100. The numbers of days on light duty were 629. A chart in Appendix C displays these figures.

An interview was also conducted with an expert in the field of exercise physiology, Mr. Dean Robertson with Guilford Technical Community College. The researcher contacted Mr. Robertson in reference to testing High Point Fire Department's firefighter's level of physical fitness. He suggested using the Micro Fit Test, with which he has had success using on local fire and emergency departments.

Firefighter Interviews

Interviews were conducted with firefighters at the two busiest fire stations in the City, Headquarters and Station One. Each of these stations has 10 firefighters on duty daily. Firefighters at these stations were enthusiastic about being tested to see what range their level of fitness ranks on the Micro Fit Test. When interviewed, they were positive about a physical fitness program being implemented and thought it would benefit the department.

Micro Fit Test

The Micro Fit Test is used to assess the physical fitness level of the general public throughout the United States. This test is used in health clubs, but has also been found to be a

very reliable tool to measure firefighter physical fitness. Statistics show that the fitness profiles of all firefighters should fall in the “fit” or “excellent” ranges. The test measures blood pressure, resting heart rate, percent of body fat, back flexibility, bench and leg press, the number of sit-ups in a 60-second time frame, and a 1.5 mile run. The combined score of all the above gives a physical fitness profile of the participant. Gender and age are also factored into the score. The test also gives the participant an interpretation of his or her fitness profile. A sample test is displayed in Appendix B.

Research Questions

1. Why should a physical fitness program and fitness test be implemented at the High Point Fire Department?

A review of the literature, interviews with firefighters and consultants, statistics of injuries and disability retirements and performance at structure fires indicate a need for a physical fitness program at the High Point Fire Department. This is represented in the literature review and stressed by many experts in the fire service field that inadequate performance during fire suppression operations was due to fatigue and over exertion, which has a direct correlation to not being physically fit.

A fitness test would indicate to the firefighter what physical condition he or she ranks in relationship to the general population. Experts in exercise physiology recommend that firefighters should fall in the fit range of the Micro Fit Test to adequately perform the duties of a firefighter.

2. What are the advantages of a physical fitness program and fitness test at the High Point Fire Department?

The advantages of having a physical fitness program would start by reducing the chance of death or injury due to the demands of the job. A physical fitness program would increase the endurance level of a firefighter and enable the firefighter to operate at a higher efficiency level and safer at a suppression operation.

The physical fitness test would be an indicator of the present physical condition of a firefighter and where he or she needs to improve.

3. What type physical fitness program would be the most beneficial for firefighters at the High Point Fire Department?

The research obtained during this study and recommended by Mr. Dean Robertson, Exercise Physiologist, indicated that a physical fitness program should include cardiovascular endurance, muscular endurance, muscular strength, and flexibility. A circuit-training program, which includes these areas, performed 45 minutes to 1 hour each shift, would increase the performance of the firefighter at a suppression operation.

DISCUSSION

The results from the fitness profile administered by Mr. Dean Robertson, exercise physiologist at Guilford Technical Community College, revealed that the firefighters at High Point Fire Department needed to be participating in a physical fitness program. The program that Mr. Robertson suggested would be 45 minutes to an hour each shift consisting of cardiovascular endurance, muscular endurance, muscular strength, and flexibility training.

A quote by Pearson et al. In the literature review reinforces the need for a program, “Firefighting requires a physical performance profile reflecting high aerobic capacity, high muscular strength and endurance, above average lean body weight and minimal body fat” (1995,

p.8). A program of this nature would reduce the risk of cardiovascular disease and increase the endurance of firefighters at a suppression operation.

The researcher has observed fireground operations in the past. It is apparent that firefighters become fatigued early in the suppression stages. Turnout gear and airpaks are very demanding on the body. Regular station maintenance will not keep a firefighter in the optimal condition needed. Pearson et al. also denotes that “studies show that merely performing the duties of a firefighter or rescue worker will not develop or maintain the fitness required for these occupations. Only a regular program of physical conditioning can accomplish the goal” (1995, p.97).

The High Point Fire Department follows the same trend in injuries as the national average of fire departments across the United States. In an article by Pearson et al. “according to the National Fire Protection Association (NFPA) survey, strains, sprains, and muscular pain account for over 40 percent of the 100,000 firefighter injuries in 1990. Over one fifth of all injuries were caused by overexertion or strain” (1995, p.8).

The High Point Fire Department could reduce these injuries by having a mandatory fitness program. In an article by Paul Davis, Ph.D., in *Fire Chief*, he writes that physical fitness programs reduce on the job injuries by one half and means to reducing occupational injuries (1997).

The author’s interpretation of the results indicates there is a serious problem concerning the health of firefighters. The National Fire Protection Association has noted this problem and has mandated that all fire departments have a physical fitness program incorporated in their daily schedule.

Fire Chiefs and Administrators seem to place physical fitness at the bottom of the list. A common misconception a firefighter may believe about himself or herself is nothing will happen

to them, they are invincible. Statistics from across the United States proves this theory to be wrong. Many articles have been written dealing with the stress related health problems associated with the firefighting profession.

There are high numbers of injuries and heart related problems due to unhealthy firefighters performing below safe capacities. The fire service needs to wake up and place fitness as a top priority before it is too late.

The results from this study may have a positive impact on the High Point Fire Department. Chief David Taylor places physical fitness as an important factor in the success of the organization. After assessing the test results of the new recruits, 10 firefighters on shift, data on injuries and disability retirements, the need for a physical fitness program was apparent.

A Standard Operating Procedure is being developed to improve the health and fitness of the High Point firefighters and will be instituted in January 2001. This will become a priority daily activity, just as checking the fire apparatus. Tracking of injuries and a fitness profile administered two times a year will be kept on all firefighters. This new standard will be a positive dimension toward the future in the High Point Fire Department.

RECOMMENDATIONS

The High Point Fire Department should implement a physical fitness program for all firefighters in the department. The program should be given the same priority as checking the equipment on the apparatus. A firefighter's fitness profile or condition is as important as the apparatus on the department. State of the art equipment is useless if the firefighter cannot perform on the fire scene. Firefighter fitness is essential to run an effective department.

The data collected from the Employee Benefits Division indicated that the injuries reported were mainly sprains and strains to joints and backs. This is a direct correlation to operating beyond a firefighter's physical capacity and continuing to work at unsafe physical levels of fatigue. A majority of disability retirements were also directly related to poor physical condition.

The results of the fitness profiles indicate that a program of cardiovascular endurance, muscular endurance, muscular strength and flexibility training would benefit the health of the firefighters in the High Point Fire Department. This can be accomplished with 45 minutes to 1 hour of circuit or interval training each day a firefighter is on duty.

Firefighter involvement should be considered to have a successful program. This can be achieved by requesting volunteers to become team leaders. These team leaders can motivate the less enthusiastic firefighter to become better physically fit. A reward incentive can also increase interest in the program. This can be achieved by recognizing the most improved, best physical condition for each age group and best all-around physically fit company awards. These are a few incentives that can assist with success of the program. The team leaders can be given the responsibility of suggesting ideas to the administration to improve the program. Guilford Technical Community College has given the High Point Fire Department permission to use their physiology lab on an as needed basis. Team leaders will be trained by Mr. Dean Robertson to administer the Micro Fit Test. This will allow the High Point Fire Department to test our firefighters without relying on scheduling with Mr. Dean Robertson.

Every effort should be taken to accommodate needs in order for the program to be successful. After the program is implemented, the report of injuries categorized by type, when, how, and any heart-related problems should be recorded to track the progress of the program.

The Micro Fit Test should be administered two times a year to measure the progress of the program. This test was chosen by the High Point Fire Department due to the success that Mr. Dean Robertson has had in his previous experience with testing emergency services agencies.

High Point Fire Chief, David Taylor, has reviewed the research and results of this project. Through the research, data and statistics gathered, Chief Taylor recognized the need for a physical fitness test to be administered and the importance of a physical fitness program to be implemented. The months of October, November, and December have been scheduled with Guilford Technical Community College to test all fire department personnel using the Micro Fit Test. Mr. Dean Robertson, Exercise Physiologist with Guilford Technical Community College, is designing a physical fitness program to meet the fire department's need. A Standard Operating Procedure mandating a mandatory physical fitness program is being developed and will become effective in January 2001. The standard set by Chief David Taylor will also be a factor in the promotional process.

REFERENCES

- Asken, M. (1994, May). Psychological strength through physical conditioning, *Firehouse*, (5) 113.
- Davis, P. (1994, June). Better fitness equal less time on scene, *Fire Chief*, (6) 18-19
- _____. (1995, August). Performance and fitness aren't the same, *Fire Chief*, (8) 20-23
- _____. (1997, January). Weigh your option, *Fire Chief*, (1) 19.
- Goodson, C. and McCrory, M. (1996). Are firefighters athletes?, *Speaking of Fire*, (4) 5-6
- Hayford, J. (1996). Firefighter Fitness – Why playing sports can't get you in shape, *Firehouse*, (5) 60-62
- Hodginson, L. (2000, August). Firefighter fitness – Gear up for fire department fitness, <http://www.lifirefighter.com/archives/fitness>. Accessed August 4, 2000
- O'Connor, J. (1996, August/September). Why aerobics?, *Firefighter's News*, (4) 5-6
- Ostrow, L. (1997, June). In good shape? Fire service wrestles with physical fitness standards, *Fire-Rescue Magazine*, (4) 84-86.
- Pearson, J., Hayford, J. & Royer, W. (1995). The importance of firefighter fitness. In Van Nostrand Reinhold (Ed.), *Comprehensive Wellness For Firefighters: Fitness and Health Guide For Fire And Rescue Workers*. New York: A Division of International Thompson Publishing, Inc.

APPENDIX A

FIRE DEPARTMENT SURVEY

PHYSICAL FITNESS PROGRAMS IN YOUR DEPARTMENT

1. What is the size of your department?
 - A.) 200 or less
 - B.) 201-500
 - C.) 501 or more

2. Does your department have:
 - A.) Mandatory program
 - B.) Optional program
 - C.) No physical fitness program
 - If your department has no program, skip to question 12.

3. If your department has a program, how long has it been in operation?

4. Has your department had a decrease in sick leave, accidents, or injuries since a program was implemented?

5. How long do your department's firefighters exercise per shift?

6. How is your department's program funded?

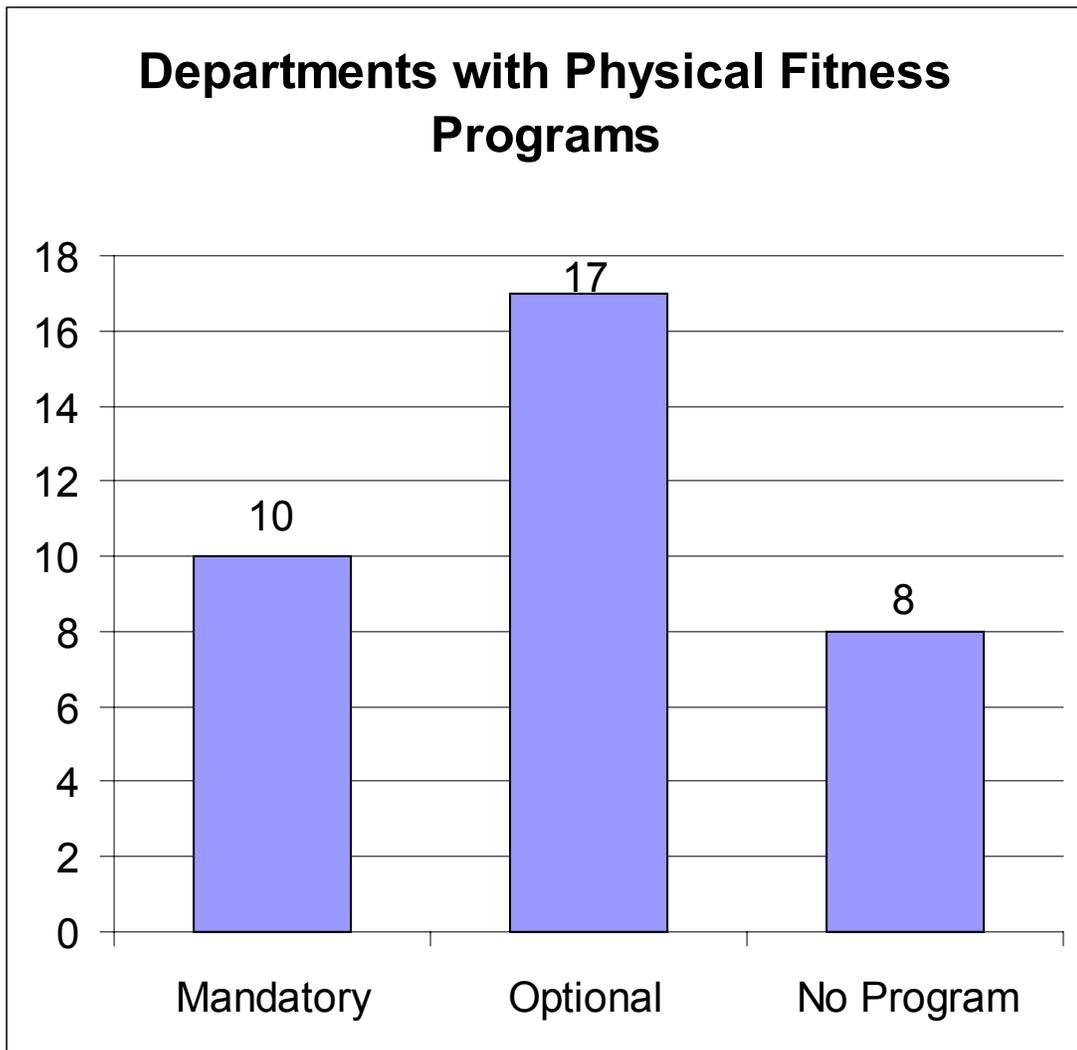
7. Have your department had assistance from a community college or private company to get a program in operation?

8. Do your department's firefighters have physicals on an annual basis?

9. What types of exercises are performed:
 - A.) Strength -
 - B.) Flexibility -
 - C.) Endurance/Cardiovascular -
 - D.) Other -

10. Does your department perform annual assessments to document progress of the program?

11. Does your department's program include the Administration Division?
12. Does the department's station Captain have the option to decide the time when exercise is performed?
13. Why does your department not have a program in place?
 - A.) Cost -
 - B.) Availability -
 - C.) Other -
14. Does your department plan to implement a program in the next two years?
15. Are your department's personnel:
 - A.) Paid -
 - B.) Combination -
 - C.) Volunteer -



APPENDIX B

**HIGH POINT FIRE DEPARTMENT FITNESS PROFILE
MICRO FIT TEST
FITNESS PROFILE**

NAME DATA RANGE AGE
 10 YEARS INCREMENTS
 GENDER TEST 1 WEIGHT DATE OF TEST
 HEIGHT TEST 2 WEIGHT NO PRIOR TESTING

SCORE	POOR		UNFIT		FAIR		FIT		EXCELLENT
SYSTOLIC BP (mmHg)	179	159	149	139	134	129	124	119	109
*									
DIASTOLIC BP (mmHg)	109	99	94	89	87	84	82	79	67
*									
RESTING HEART RATE (bpm)	105	99	95	90	85	80	75	70	60
*									
PERCENT FAT (%)	33.0	30.0	27.0	24.0	20.0	18.0	16.0	12.0	08.0
*									
BACK FLEXIBILITY (cm)	25	31	35	37	42	44	47	50	53
*									
BENCH PRESS	0.80	0.88	0.93	0.99	1.06	1.14	1.22	1.32	1.48
*									
LEG PRESS	1.51	1.63	1.74	1.83	1.91	1.97	2.05	2.13	2.27
*									
SIT UPS (60 Sec.)	30	33	36	38	40	42	45	47	51
*									
1.5 MILE RUN	15.10	14.13	13.22	12.51	12.18	11.41	10.47	10.16	9.09
*									
TOTAL FITNESS SCORE	10	20	30	40	50	60	70	80	90

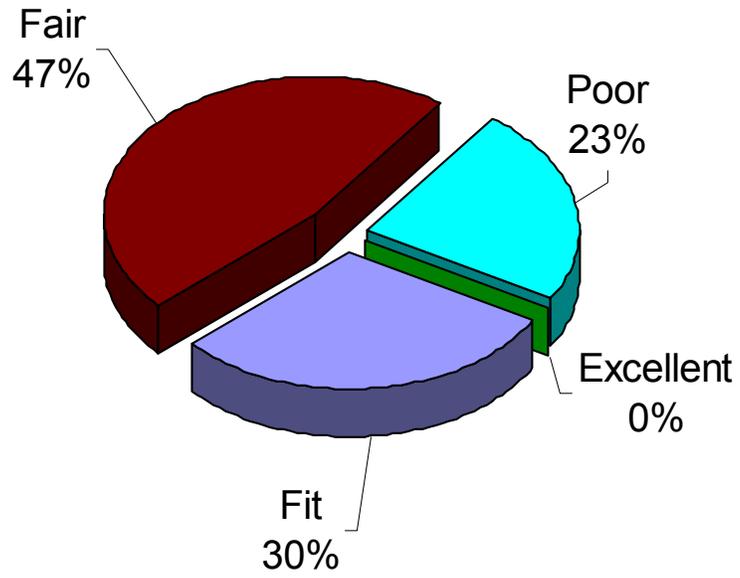
Excellent Range: 80-90

Fit Range: 70-79

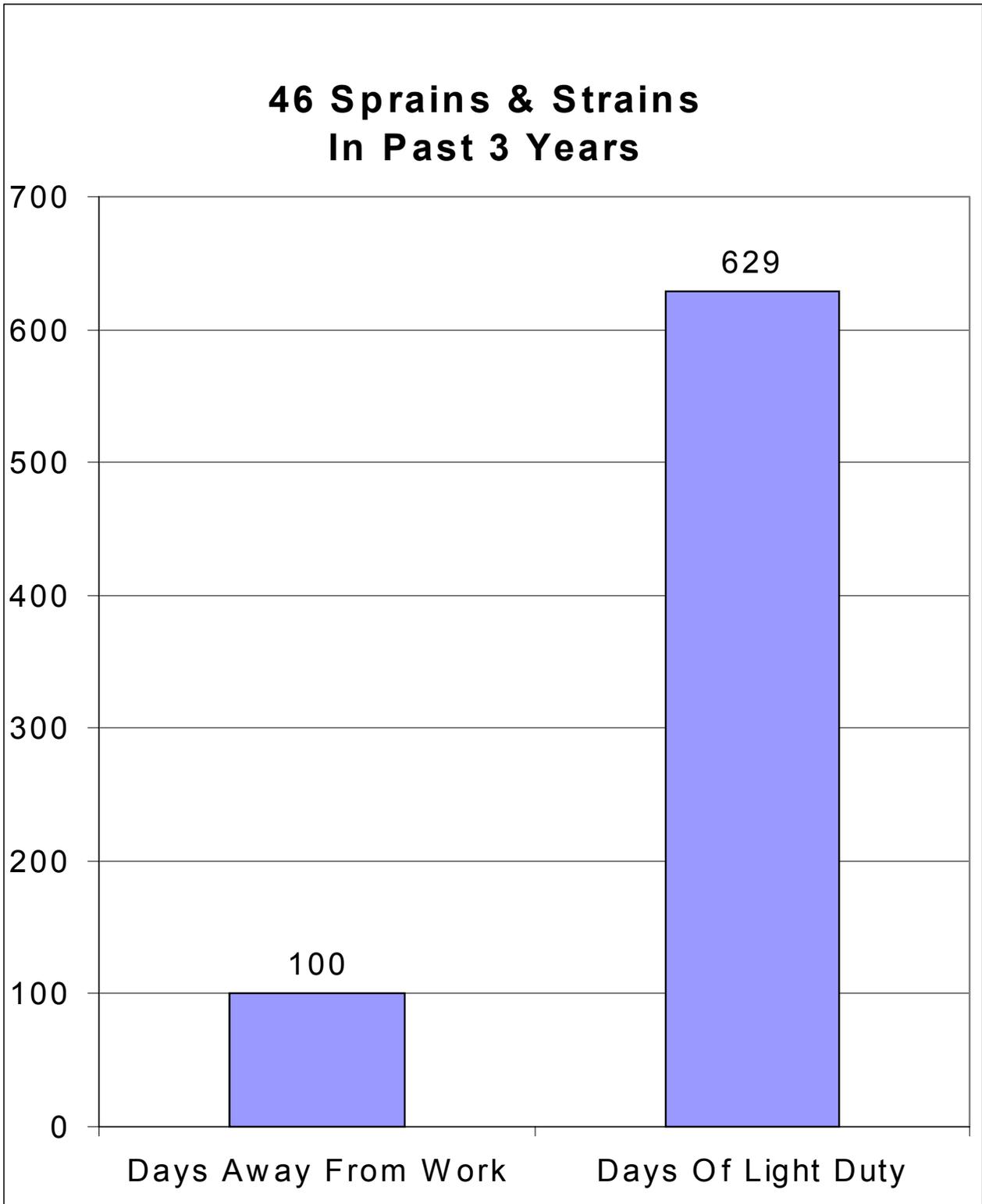
Unfit Range: 60-69

Poor Range: 0-59

Fitness of Personnel



APPENDIX C



Retirements - Past 5 Years

