IMPACT OF THE FORT WORTH FIRE DEPARTMENTS PHYSICAL FITNESS PROGRAM FROM 1986 THROUGH 1996

EXECUTIVE DEVELOPMENT

BY: Jay D. Peacock
Fort Worth Fire Department
Fort Worth, Texas

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

February 1998

ABSTRACT

The Fort Worth Fire Department has provided a health and physical fitness program for its employees since the early 1980s. The Fort Worth program identified cardiovascular efficiency and endurance, muscular strength and endurance, flexibility, and body composition as the major components of its physical fitness program when considering the effect of the program on individual fire fighters. However, the problem that confronted the Fort Worth Fire Department is that little research had been conducted to determine the overall effectiveness of its physical fitness program on the department as a whole.

The purpose of this study was to evaluate the effectiveness of the Fort Worth Fire Department physical fitness program from 1986 through 1996. The evaluative research method was employed to conduct this study. Research questions that were to be answered by this study were:

1. What criteria do other fire departments use to measure the effectiveness of their physical fitness program?
2. What criteria should the Fort Worth Fire Department use to measure the effectiveness of its physical fitness program?
3. How successful was the Fort Worth Physical Fitness Program when compared to the selected criteria?

A literature review was conducted followed by a survey of 150 fire departments listed in the International Association of Fire Chiefs Metro Section. Results from the survey were tabulated and research was conducted to answer the stated research questions. Research indicated that the physical fitness program had had a positive influence on the fitness level of the Fort Worth Fire Department. Significant cardiac findings, lost time injuries, as well as workers compensation cost had decreased as overall fire fighter fitness levels increased.

Recommendations resulting from this research included establishing a joint labor/management fitness committee, providing for a program coordinator, initiating an injury prevention program, developing policy to deal with employees who fail to achieve minimum fitness standards, and establishing an effective record keeping system to facilitate continuous evaluation of the physical fitness program.

TABLE OF CONTENTS

Title **Page**

INTRODUCTION

Few people would argue the fact that fire fighting remains one of the most physically demanding occupations in the world today. “The basic duties of a firefighter require above average strength, endurance, and agility” (Phoenix Fire Department, 1994 pg1). Because of the physical demands placed on the firefighter, fire fighting is also one of the most hazardous jobs in the United States. One study conducted by the International Association of Fire Fighters (IAFF) indicates that statistically, 50% of all fire fighters could expect to be injured within the course of a year and that sprains and strains are the leading cause of injuries (Hilyer, Brown, Sirles, & Peoples, 1990). The most current IAFF injury survey indicates that “nearly one out of every three fire fighters was injured in the line of duty” (IAFF 1996).

Fire service professionals generally agree that a healthier lifestyle and improved physical fitness of fire fighters tend to reduce on duty injuries, sick leave usage, and workers comp cost. In light of these statistics, fire service professionals struggle to devise strategies to improve the overall health and physical fitness of today’s fire fighters. This continuous effort towards physical fitness improvement has resulted in the existence of a number of health and fitness programs throughout the fire service. Even though the fire service has experienced an increased number of programs, consensus has yet to be reached among fire service professionals as to what constitutes an effective health and physical fitness program. Furthermore, little information exists that describes procedures for measuring the overall effectiveness of a physical fitness program.

The Fort Worth Fire Department, like many other departments, has provided a health and physical fitness program for its employees since the early 1980s. The Fort Worth program identifies cardiovascular efficiency and endurance, muscular strength and endurance, flexibility, and body composition as the major components of its physical fitness program when considering the effect of the program on individual fire fighters. These statistics can be easily researched for the individual employee. However, the problem that confronts the Fort Worth Fire Department is that little or no research has been conducted to determine the overall effectiveness of its physical fitness program on the department as a whole.

The purpose of this study is to evaluate the effectiveness of the Fort Worth Fire Department physical fitness program from 1986 through 1996. The research method employed in this study is evaluative in nature yet relies heavily on historical data to answer specific portions of the research questions. The research questions to be answered by this study are:

1. What criteria do other fire departments use to measure the effectiveness of their physical fitness program?
2. What criteria should the Fort Worth Fire Department use to measure the effectiveness of its physical fitness program?
3. How successful was the Fort Worth Physical Fitness Program when compared to the selected criteria?

BACKGROUND AND SIGNIFICANCE

The City of Fort Worth encompasses 300 square miles of north central Texas and is populated by 484,506 residents. Fire and emergency medical service for the city is provided by the Fort Worth Fire Department. Additionally the department is responsible for the city's emergency management function, fire prevention and education programs, arson investigation, bomb disposal, hazardous material response, technical rescue, USAR, and emergency marine response. The Fire Department is staffed with 688 uniformed personnel operating 35 fire stations.

In 1981 the Fort Worth Fire Department began a voluntary physical fitness program. Firefighters were given the opportunity to receive an annual physical assessment provided by a local hospital under contract with the City of Fort Worth. Participation in this program was voluntary and the employee was required to pay a portion of the cost of the physical assessment. Firefighters were allowed time to exercise during their shift but participation was not mandatory.

From 1983 through the present, the annual physical assessments became mandatory for all firefighters with the City paying 100% of the cost. Additionally the fire department provides exercise equipment at each fire station and a complete workout facility at the fire training facility. Workout time is allowed and encouraged during the shift but remains non-mandatory (Appendix A). Beginning in 1986 as part of the city's contract with the physical assessment provider, the provider offers free health club memberships

to all uniformed fire department personnel. “One of the main goals of the Physical Fitness Program is to lessen the frequency and severity of employee injuries by increasing muscular strength and physical stamina” (Fort Worth Fire Department).

The components of the physical assessment currently used by the Fort Worth Fire Department are designed to evaluate cardiovascular endurance, upper and lower torso muscular strength and endurance, flexibility, and body composition. Additionally, vision, hearing, dietary habits, as well as blood work to test for HDL and LDL cholesterol levels are examined.

The physical assessment consist of a series of exercises which include a seated reach test, skin fold test, 1 minute pushup test, 1 minute curl up test, spirometry, ekg, and the modified Balky treadmill protocol. These exercises are followed by a hands on examination from the fire department contract physician.

The seated reach test is designed to measure flexibility. The 1-minute pushup test measures upper torso strength and endurance while the 1-minute curl up test is designed to measure abdominal strength and endurance. The Bruce Balke treadmill protocol is used to estimate VO2Max and thus cardiovascular strength and endurance (P.B. Heddins, personal interview, September 9,1997). Firefighters are assessed points based on their individual performance on each exercise. Total points are then calculated and an overall category is assigned to the individual (Appendix B). The point scales used to evaluate

individuals were established based on age and gender and define the point ranges for Superior, Excellent, Good, Fair, Poor and Very Poor categories.

Once a firefighter is assessed and assigned a category, follow up is voluntary unless a serious health problem is detected. At that point the individual is referred to his or her personal physician for further evaluation. The firefighter is placed on sick leave until his or her physician releases them back to full duty. No other monitored intervention or follow up program is conducted throughout the year. Additionally, statistical analysis or cost analysis is not conducted to determine the impact of the physical fitness program upon the department as a whole.

Currently, the city of Fort Worth expends a considerable amount of resources in providing an opportunity for its firefighters to improve their health and physical fitness levels. The intent of this research is to evaluate the impact of that investment upon the health and fitness of Fort Worth firefighters.

For fire and rescue work, studies have shown that fitness is directly related to performance (Pearson, Hayford & Royer, 1995 pg. 22).This research is relevant to the Executive Development course in that it relates to the section on service quality. "Performance, the primary operating characteristics of a product or service" (NFA pg. SM 11-9), can be greatly enhanced in the fire service by a meaningful and successful physical fitness program.

LITERATURE REVIEW

Fire fighting remains one of the most hazardous occupations in the United States today. According to some reports, "During the past 20 years, the life expectancy of the fire fighter has decreased. The number one killer of fire fighters seems to be heart attacks due to stress, which could be attributed to the lack of a structured physical conditioning program in the fire service" (Fellers, 1997 pg. 7). Additionally, "cancer rates among fire fighters are reported to be from 100 to 300 percent higher than in any occupation" (Healy, 1988 pg. 12). The 1996 IAFF Death and Injury Survey supports these claims. According to the IAFF, 56 percent of all line of duty deaths in 1996 were caused by heart attack and stroke (IAFF 1996). In addition to the grim statistics on fire fighter deaths, one out of every three fire fighters was injured in the line of duty in 1996 (IAFF 1996). "When compared to the data compiled for private industry by the U.S. Bureau of Labor Statistics, the 1996 Fire Fighter Death and Injury Survey indicates that incidence or frequency of fire fighter job related injury is 4.0 times that of workers in private industry" (IAFF 1996, pg. 5). Of these reported injuries, physical fitness related injuries such as sprains and strains are the leading type of injury suffered by fire fighters. Of all injuries received, sprains and strains represent 48 percent of all fire fighter injuries (IAFF 1996).

Based on these statistics compelling arguments can be made that physical fitness plays a major role in the health and well being of today's fire fighter. Many studies support the benefits of improved physical fitness. "Fit personnel are able to perform task more quickly and with fewer injuries than non-fit personnel" (Pearson, Hayford, Royer

1995 pg.22). “A high level of aerobic fitness, combined with a low level of risk factors for cardiovascular disease, can help provide fire fighters with survival insurance in their hostile work environment” (Davis, Biersner, Barnard & Schamadan 1982 pg.11). Anderson and Cohen report

> “Because there is no cure for the major diseases, basic fitness is the only protection against such maladies as cancer, stroke and heart disease. Furthermore, it’s estimated that as much as 90 percent of all illness is caused by poor nutrition, lack of proper exercise, and habits such as smoking and excessive drinking” (Anderson and Cohen, 1981 pg.60).

According to the Fire Service Joint Labor Management Wellness-Fitness Initiative

> “Aerobic fitness is fundamental to the health, safety and performance of all uniformed personnel. A program of regular aerobic exercise can improve cardiovascular fitness and maintain normal body composition, weight, blood pressure, cholesterol, and blood sugar. In fact, an analysis demonstrated that inactive persons have a 90% higher risk of heart attack than physically active persons” (IAFF 1997, pg.52)

Studies indicate that physical fitness is important to the fire fighter but what is physical fitness? “According to the Presidents Council on Physical Fitness, fitness is the ability to carry out daily task with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies” (University of California, Berkeley, 1991 pg.213). Physical fitness is part of total fitness

that is concerned with the effects of exercise on the body and the body's functions (Golding, Myers, and Sinning, 1989).

Physical fitness is most easily understood by examining its components. Health and fitness experts generally agree that fitness encompasses four general areas. These components are cardiovascular efficiency and endurance, muscular strength and endurance, flexibility, and optimal body composition (Aerobics and Fitness Association of America, 1995 pg. 1).

According to the University of California, Berkely, the most vital element is cardiovascular endurance (University of California, Berkely, 1991 pg.213). This claim would appear to be relevant to the fire service in light of recent death and injury surveys. According to fitness expert Bill Pearl "Cardiovascular training is an important element of general conditioning. It refers to exercises that strengthen the heart, lungs, and circulatory system" (Pearl, 1986 pg.17). Dr. Kenneth Cooper writes that "heart disease is, by and large, a self inflicted malady" (Gordon, Gibbons & Cooper, 1990 pg. 13). Even though this information is not new, 56 percent of all fire fighter line of duty deaths are still caused by heart attack.

NFPA 1500 mandates that "the fire department shall establish and provide a physical fitness program to enable members to develop and maintain the appropriate level of fitness to safely perform their assigned function" (NFPA, 1997 pg. 1500-21). There are a variety of views however, on the question of making a physical fitness program

mandatory. Davis writes (Davis, 1991) that fitness programs should be a mandatory condition of employment. “Experience has shown voluntary programs soon become no program” (Davis, 1991 pg.36). Another EFO study indicated that voluntary programs did not attract those most in need of a fitness program (Bennett 1997).

“In an attempt to improve fire fighter well being, particularly cardiovascular fitness, several departments have made great strides in developing and implementing innovative fitness programs” (Ostrow, 1997 pg.86). While it is true that many departments have initiated physical fitness programs, little research exist concerning the overall impact of these programs on their respective departments. Because of the differences in the individual programs few standardized measures exist in the fire service to determine the overall effectiveness of the program. “The intent is to maintain the appropriate level of fitness and reduce the probability of severe injury and illness” (Davis 1995 pg. 22). “One of the main goals of the Physical Fitness Program is to lessen the frequency and severity of employee injuries by increasing muscular strength and physical stamina” (Fort Worth Fire Department). According to the Physical Fitness Coordinators Manual for Firefighters (FEMA, 1990 pg. 14-8) “Another issue raised regarding a physical fitness program is the relationship of exercise to the reduction of cardiovascular disease”. Data indicates that people who routinely participate in a physical fitness program demonstrate a certain immunity to cardiovascular disease (FEMA 1990). This study is concerned with determining the most appropriate way of measuring the success of the stated intent for the Fort Worth Fire Department.

The Fire Service Joint Labor Management Wellness/Fitness Initiative has attempted to address some of these concerns and recognizes the fact that an effective program should realize significant cost savings in lost work time, workers compensation, and disability (IAFF 1997). Studies by Davis indicate that fire departments have shown that improved fitness resulted in significant cost savings through reduced incidence and severity of on the job injuries (Davis, 1989). Finally, if the four components of physical fitness are cardiovascular efficiency and endurance, muscular strength and endurance, flexibility, and body composition (Jorden 1995) then it would be logical to assume that physical fitness programs would be designed to improve those areas; thus improvement in these areas and the resulting improvements in the cost and compensation issues, could indicate success in the over all physical fitness program.

PROCEDURES

This research was conducted in Fort Worth, Texas, a city of approximately 484,506 people. The Fort Worth Fire department is a paid department currently consisting of 685 uniformed personnel. The Fire Department has participated in a physical fitness program since the early 1980's and since the inception of the physical fitness program, the Fire Department has contracted with a local hospital to conduct annual medical/physical assessments. The department has been under contract with Huguley Hospital from 1986 through the present. Even though the department has participated in a physical fitness program it has never conducted a formal evaluation of the program in order to determine

the effectiveness of the over all program. The purpose of this research was to establish an accurate method of evaluating the effectiveness of physical fitness programs and then using that method to evaluate the Fort Worth program.

Research began with a literature review conducted at the Learning Resource Center (LRC) at the National Emergency Training Center (NETC) in August of 1997. Further literature reviews were conducted at the Cleburne Public Library in Cleburne Texas, the Fort Worth Public Library in Fort Worth Texas, the City of Fort Worth Resource Center, the Fort Worth Fire Department Resource Center, and the Huguley Hospital Health and Fitness Assessment Center.

The literature review focused on identifying fitness related issues in the fire service, defining physical fitness, reviewing physical fitness programs, and determining criteria to evaluate the effectiveness of a physical fitness program. The literature review examined both fire service specific information as well as general information concerning physical fitness.

Brad Heddins, M.S., Manager and Exercise Physiologist for Huguley Hospital was interviewed on September 9, 1997 to gain his perspective about the proper methods of measuring the effectiveness of a physical fitness program. He has been associated with the Fort Worth Program since 1986 and was familiar with the goals of the Fort Worth program. The interview was conducted for one hour followed by additional phone

conversations and explored a variety of topics including statistics that could be used to analyze the effect of a fitness program.

A survey instrument was developed to gather information from other fire departments of similar size (Appendix C). The survey questions were based on information gathered during the literature review and from the interview conducted with Brad Heddins. Information solicited by the survey concerned the size of the department, the existence of a physical fitness program, if the program was mandatory, number of years in the program, annual medical/physical requirements, whether or not categories are assigned based on test results, departmental policy for dealing with failures in the program, whether or not the department has conducted an evaluation of the program, and what criteria was used to evaluate the impact of the program.

The survey was reviewed by a group of randomly selected members of the Fort Worth Fire Department. After the initial review the survey was revised based on input received from the initial review process. After conducting a final review the surveys were mailed to all departments listed in the International Association of Fire Chiefs Metro Section. One hundred and fifty surveys were mailed, of which 112 were returned. The data from the survey was analyzed to determine what information, if any, would be useful in establishing a criteria to evaluate the Fort Worth Physical Fitness Program.

Guided by the survey results (Appendix D), information was gathered in January 1998 from the City of Fort Worth Budget Office, City of Fort Worth Risk Management

Department, Fort Worth Fire Department Health and Safety Officer, and the Huguley Fitness Assessment Lab. The purpose of this information was to evaluate the Fort Worth Physical Fitness Program in accordance with the information gathered through the literature review and from the survey. Information concerning annual budgeted staffing levels, workers comp cost, number of exertion related injuries, and physical assessment results based on fitness categories were compiled and analyzed to determine the effect of the fitness program on the department.

LIMITATIONS AND ASSUMPTIONS

While a number of departments conduct physical fitness programs, very few have conducted an evaluation of the over all effect of their program. Of those that have evaluated their program, few if any use the same criteria for evaluation. This research is limited by the lack of consistent evaluation criteria that exist in the fire service today. Additional limitations are placed on this research by the lack of consistent or standardized record keeping within the City of Fort Worth and the Fort Worth Fire Department.

Another limitation to this research is the change in the State of Texas Workers Comp law that became effective in 1990. This change was concerned with the way that disability payments were made and could have had the effect of lowering the overall workers comp cost to the city from 1990 through the present. Additional limitations exist

due the workers comp procedures for the City of Fort Worth. In Fort Worth once an injured employee is released to return to work in a light duty capacity his or her time is no longer carried in a workers comp capacity. Because the employee is not filling a budgeted position while on light duty, the use of overtime must be employed to fill that employees budgeted position. It is difficult under our present procedures to calculate this additional injury related cost to the department.

Assumptions were made in regards to the data collected for this research. It is assumed that all exertion related injuries and cardiovascular episodes can or could have been affected by the employees' level of physical fitness. It is also assumed that some of the injury and workers comp data is influenced by budgeted staffing levels within the department as well as other factors that can not be readily identified.

RESULTS

1. **What criteria do other departments use to measure the effectiveness of their physical fitness program?**

The literature review indicated that physical fitness is important to the fire fighter. Health and fitness experts generally agree that fitness encompasses four general areas. These components are cardiovascular efficiency and endurance, muscular strength and endurance, flexibility, and optimal body composition (Aerobics and Fitness Association

of America, 1995 pg.1). NFPA 1500 mandates that "the fire department shall establish and provide a physical fitness program to enable members to develop and maintain the appropriate level of fitness to safely perform their assigned function" (NFPA, 1997 pg. 1500-21). Taking this concept further, Davis (1995) states that the intent is to reduce the probability of severe injury and illness. Additionally the Fire Service Joint Labor Management Wellness/Fitness Initiative recognizes the fact that an effective program should realize significant cost savings in lost work time, workers compensation, and disability (IAFF, 1997).

The survey of the IAFC Metro Section Fire Departments (Appendix D) indicated that 43 percent of all respondents have a formal physical fitness program. Of those programs 71 percent indicated that their physical fitness program was mandatory. Of those departments with programs 23 percent have had their program for four years or less, 38 percent have had a program from five to ten years, and 39 percent have had their program for over ten years. Fifty percent of all respondents, regardless of the existence of a physical fitness program or not, required their employees to take an annual or periodic medical/physical evaluation. Fifty-four percent of those departments requiring annual evaluations ranked their fire fighters in categories depending upon their individual performance during the physical.

Failure to achieve an acceptable rating based on the results of the annual or periodic evaluations received different reactions from the surveyed departments. Twenty-six percent assigned unacceptable performers to light duty assignments. Twenty-six percent

of the departments placed the fire fighter on a mandatory workout program. Ten percent of the departments stated that employees were subject to disciplinary action while 19 percent took no action of any kind.

Of all of the departments that have formal physical fitness programs, 31 percent have evaluated the overall success of their program. Of these departments who have evaluated their programs, no two departments have used the same criteria for evaluation purposes. Evaluative measures ranged from comparing the number of pass and failures or acceptable or non acceptable categories achieved each year, evaluating workers comp injuries and the related cost, sick leave usage, and improvement of fitness reflected by the number of personnel in the upper level categories of the fitness program.

2. **What criteria should the Fort Worth Fire Department use to evaluate its physical fitness program?**

Health and fitness experts identify four components of fitness. These components, cardiovascular efficiency and endurance, muscular strength and endurance, flexibility, and optimal body composition (Aerobics and Fitness Association of America, 1995) are the major components of the Fort Worth Physical Fitness Program. Individual fire fighters are evaluated annually based on these components of fitness. Based on findings during the individual exams, fire fighters are placed in the fitness categories of superior, excellent, good, fair, poor, or very poor. These facts would indicate that comparison of the percentage of fire fighters scoring in the upper categories of superior, excellent, and

good to the percentage of fire fighters scoring in the lower categories of fair, poor, and very poor, would be one appropriate measure of the affect of the overall fitness program upon the department. Another appropriate measure would be comparing the number of significant cardiac findings during the medical exam portion of the program to those found in previous years.

Many departments surveyed consider workers compensation cost as well as the number of on the job injuries as key measurements of a successful physical fitness program. An effective program should realize significant cost savings in lost work time, workers compensation, and disability (IAFF, 1997). A comparison of annual lost time injuries as a percentage of total injuries appears to be a relevant indication of the affect of a fitness program. Additionally, a comparison of workers comp cost to identify trends may be a valid measure of effectiveness of a physical fitness program.

Nationally, physical fitness related injuries such as sprains and strains are the leading type of injury suffered by fire fighters. Of all fire fighter injuries received in 1996, forty-eight percent were exertion related, specifically sprains and strains (IAFF 1996). These statistics would indicate that a comparison of exertion injuries as a percentage to total injuries is an indicator of an effective program.

3.How successful was the Fort Worth Physical Fitness Program when compared to the selected criteria?

When comparing the percentage of fire fighters scoring in the upper fitness categories of superior, excellent, and good to the number of fire fighters scoring in the lower categories, it appears that Fort Worth's program has had a positive effect overall on its employees. In 1986 only 41 percent of all fire fighters scored in the top three categories as compared to 83 percent in the 1996/97 test period. However, there appears to be a slight downward trend in upper level scores over the past five years.

TABLE 1.

CATEGORY	1986-1987	1988-1989	1989-1990	1990-1991	1991-1992	1992-1993	1994-1995	1995-1996	1996-1997
SUPERIOR	2%	18%	15%	26%	41%	33%	36%	27%	30%
EXCELLENT	13%	28%	31%	37%	29%	35%	31%	38%	33%
GOOD	26%	28%	28%	25%	21%	21%	20%	23%	20%
FAIR	46%	25%	27%	13%	9%	11%	12%	12%	10%
POOR	11%	0.5%	0%	0.4%	0.4%	0.2%	0%	0.5%	0.7%
VERY POOR	1%	0%	0%	0%	0.1%	0%	0.2%	0.3%	0.3%
PERCENT OF TOTAL EMPLOYEES TESTED IN THE "SUPERIOR," "EXCELLENT," AND "GOOD" CATEGORIES									
	41%	74%	74%	88%	91%	89%	88%	88%	83%

*No testing performed in 1993-1994.

A comparison of significant cardiac findings yielded some interesting data. Significant cardiac findings have steadily declined over the past ten years. In 1986 ten significant findings occurred. In 1996 that number had dropped to one . These findings indicate that Fort Worth's program has had a positive impact on the cardiovascular fitness of the departments' personnel. However, an unusual finding did occur during this study. In 1994 annual physicals were suspended for one year until a new contract could be negotiated with the health and fitness provider. During this period, two active fire

fighters suffered fatal non line of duty heart attacks. Evaluation of historical data indicates that no other fatal heart attack of an active employee had occurred in the preceding eight years nor has a fatal cardiovascular episode occurred since.

Table 2.

SIGNIFICANT CARDIAC FINDINGS

YEAR	SIGNIFICANT CARDIAC FINDINGS
1986	10
1987	8
1988	6
1989	4
1990	4
1991	3
1992	4
1993	2
1994	NO TEST 2 ACTIVE FIREFIGHTERS DIE OF HEART ATTACK (NON LINE OF DUTY)
1995	2
1996	1
1997	0

NOTE: Significant cardiac findings are those that require referral to a cardiologist.

The issue of comparing workers compensation cost was made difficult by the lack of adequate and specific information concerning the type of injury and the total financial impact of the injury. A comparison was made of total compensation cost as well as compensation cost per capita. Both total compensation cost as well as per capita cost increased from 1986 until 1991. Since 1992 compensation cost have steadily decreased . It is difficult however, to determine the impact of the physical fitness program upon workers compensation cost based on our current records system.

Table 3.

WORKERS' COMPENSATION PER CAPITA COMPARISON

YEAR	BUDGETED STAFFING	TOTAL COMPENSATION COST	PER CAPITA COMPENSATION COST
1986	711	$ 431,748	$ 607
1987	740	573,969	776
1988	726	606,336	835
1989	717	988,020	1,378
1990	717	891,429	1,142
1991	698	1,255,462	1,748
1992	661	909,488	1,355
1993	645	796,524	1,224
1994	652	789,893	1,203
1995	654	589,338	887
1996	674	597,887	877

When comparing lost time injuries, it is difficult to assess the total affect of the physical fitness program upon this statistic because there were no means of determining what percent of the injuries were exertion injuries or physical fitness related. Additionally there is no accounting process in place to determine the financial impact of fire fighters assigned light duty positions in lieu of being in a lost time status. However, a comparison of lost time injuries indicates a downward trend when compared as a percentage of total injuries. In 1986 lost time injuries represented 20 percent of all injuries. That number had decreased to 8 percent by 1996.

Table 4.

LOST TIME INJURIES
PERCENT OF TOTAL REPORTED

YEAR	BUDGETED STAFFING	TOTAL REPORTED INJURIES	TOTAL LOST TIME INJURIES	% OF TOTAL REPORTED
1986	711	323	66	20%
1987	740	319	69	22%
1988	726	288	49	17%
1989	717	266	58	22%
1990	717	246	57	23%
1991	698	308	54	18%
1992	661	497	60	12%
1993	645	258	47	18%
1994	652	311	41	13%
1995	654	271	33	12%
1996	674	320	24	8%

The exertion injury comparison shed little light on the impact of the Fort Worth Physical Fitness Program. Reported exertion injuries have remained fairly constant over the past ten years. There is very little difference when comparing exertion injuries as a percentage of total injuries or by comparing total injuries from one year to the next. This would indicate that that the Fort Worth program has not had a significant impact on the number of reported exertion injuries over the past ten years. However, it is difficult to determine how many of the reported exertion injuries actually resulted in lost time injuries. This could be a key indicator of program effectiveness if this data were available. Additionally, exertion injury results may be slightly skewed due to fluctuations in departmental staffing levels.

Table 5.

EXERTION INJURY COMPARISON
PERCENT OF TOTAL INJURIES

YEAR	BUDGETED STAFFING	TOTAL REPORTED INJURIES	TOTAL EXERTION INJURIES	% OF TOTAL INJURIES
1986	711	323	130	40%
1987	740	319	126	40%
1988	726	288	129	45%
1989	717	266	118	44%
1990	717	246	128	52%
1991	698	308	135	44%
1992	661	497	129	26%
1993	645	258	154	60%
1994	652	311	137	45%
1995	654	271	141	52%
1996	674	320	133	42%

DISCUSSION

Few fire service professionals dispute the benefits of having a physically fit work force. This fact is well supported in the literature review. “In an attempt to improve fire fighter well being, particularly cardiovascular fitness, several departments have made great strides in developing and implementing innovative fitness programs” (Ostrow, 1997 pg.86). Results from this research support this claim also. It is apparent from the survey conducted that a growing number of fire departments throughout North America are implementing physical fitness programs within their departments. Forty three percent of the surveyed departments reported having programs in existence and many of the

departments that did not currently have programs, indicated that they were in the process of developing one.

"A program of regular aerobic exercise can improve cardiovascular fitness and maintain normal body composition, weight, blood pressure, cholesterol, and blood sugar. In fact, an analysis demonstrated that inactive persons have a 90% higher risk of heart attack than physically active persons" (IAFF 1997, pg.52). Results from this research appear to support this claim also. Significant cardiac findings have been significantly reduced within the Fort Worth Fire Department. Data from Fort Worth's physical fitness assessments indicate a 90 percent reduction in significant cardiac findings over a ten year period.

NFPA 1500 mandates that "the fire department shall establish and provide a physical fitness program to enable members to develop and maintain the appropriate level of fitness to safely perform their assigned function" (NFPA, 1997 pg. 1500-21). Davis writes (Davis, 1991) that fitness programs should be a mandatory condition of employment. "Experience has shown voluntary programs soon become no program" (Davis, 1991 pg.36). Another EFO study indicated that voluntary programs did not attract those most in need of a fitness program (Bennett 1997). Research results support these findings as well. Of those survey respondents who had physical fitness programs, 71 percent indicated that their program was mandatory.

"One of the main goals of the Physical Fitness Program is to lessen the frequency and severity of employee injuries by increasing muscular strength and physical stamina" (Fort Worth Fire Department). Even though research indicates that improvements in muscular strength and physical stamina have occurred, results concerning frequency and severity of employee injuries are inconclusive.

The Fort Worth Physical Fitness Program has been in place since the early 1980's. Measuring the impact of the program upon the department has been difficult at best. Few standardized guidelines currently exist to evaluate program effectiveness. This study employed different techniques in an effort to measure the effectiveness of the Fort Worth program over a ten year period. The results of this research indicate that the Fort Worth Physical Fitness Program has had a positive affect on the department. Improvements in overall fitness are evident in the fact that 83 percent of all Fort Worth fire fighters currently score in the top three fitness categories as compared to only 41 percent ten years ago. Significant cardiac findings have been reduced by 90 percent during this same period. Workers compensation cost as well as lost time injuries have been on the decline for the past six years. All of which could be attributed to the impetus placed on physical fitness within the department.

The City of Fort Worth has expended considerable resources in providing a physical fitness program. It is apparent through this research that those resources were not wasted. Further study would be required to more accurately determine the impact of this investment and further study should be conducted. Nationally, fire departments typically

invest more than 90 percent of their budgets on personnel cost. It would appear logical that sufficient funds should be allocated to protect that investment in human resources. Providing an effective physical fitness program may be the best investment that a department can make to achieve that goal.

RECOMMENDATIONS

Fort Worth's Physical Fitness Program has been successful in accomplishing many of its stated objectives. Much has been accomplished over the past ten years. Despite the success of the current efforts however, some aspects of the program have a need for improvement. Based on the data gathered from this study the following recommendations should be implemented.

1. A physical fitness program is effective only if employees participate. A joint labor/management Fitness Committee should be established to address on going physical fitness issues within the department including the issue of mandatory participation in on duty physical fitness activities. It is crucial that both labor and management support the fitness program and a fitness committee could help facilitate that support.
2. Program coordination is crucial to the success of the program. Lack of coordination resulted in the suspension of physical fitness evaluations for the 1993/94 budget year. During this period two active fire fighters suffered fatal cardiac episodes. Over all

program coordination should be assigned to one individual. This individual should be an exercise specialist with a thorough knowledge of the job of a fire fighter.

3. Successful fitness programs focus on prevention of injury and illness. The Fort Worth Fire Department is still plagued with a constant rate of reported exertion type injuries. Its approach to injury has been historically one of tracking numbers and types of injuries with little or no regards to injury prevention. It is recommended that Fort Worth implement a proactive approach to injury prevention similar to the approach recommended by the Fire Service Joint Labor Management Wellness-Fitness Initiative.
4. Unless a significant health risk is detected during the physical fitness assessment, little or no follow up occurs with employees who demonstrate poor fitness levels. As a result, we continue to experience a small percentage of employees who consistently score in the lower fitness categories. It is recommended that the department consider the development of a peer fitness trainer program. Additionally, it is recommended that policy be developed to address the issues of unacceptable fitness evaluations.
5. The greatest limitation to this research was the difficulty in obtaining or the lack of available data. It is recommended that the fire department create and maintain an in house data base to track trends in fitness levels, injuries, total injury related cost including light duty cost, major medical problems identified, and other pertinent information. Additionally, it is recommended that this data be analyzed on an annual basis to identify trends within the department. Comparisons should be made of the percentage of employees scoring in the top three fitness categories, significant cardiac

findings, total workers compensation cost as well as total lost time injury cost, and of exertion type injuries compared to total injuries.

References

Anderson, J.L. & Cohen, M. (1981) The Competitive Edge: The West Point Guide for the Weekend Athlete. New York: William Morrow and Company

Bennett, R. (1997) Impact of the Aurora Fire Department Physical Fitness Program. Emmitsburg, MD: National Fire Academy

Davis, P., Biersner, R.J., Barnard, R.J. & Schamadan, J. (1982). How Fit are Fire Fighters? Fire Service Today, 72 (2) 11-14

Davis, P.O. & Dotson, C.O. (1991) Managing Fitness. Fire Chief 35 (2) 36-39

Davis, P.O. (1995) Performance and Fitness Aren't the Same. Fire Chief 39(8) 20-23

Federal Emergency Management Agency United States Fire Administration. (1990). Physical Fitness Coordinator's Manual for Fire Departments. Emmitsburg, MD: Author.

Fellers, W.A. (1997) Life Expectancy for Firefighters Decreases. Fire Talk, 3 (4) 7

Fort Worth Fire Department (1995) Standard Operating Procedures: Health and Physical Fitness Program. Fort Worth, TX: Author

Golding, L.A., Myers, C.R., & Sinning, W.E. (1989) Y's Way to Physical Fitness: The Complete Guide to Fitness Testing and Instruction. (3rd ed.) Champaign, Ill: Human Kinetics Publishers, Inc.

Gordon, N.F., Gibbons, L.W. & Cooper, K.H. (1990) The Cooper Clinic Rehabilitation Program. New York, NY: Simon and Schuster

Healy, T. (1988) We're Getting Healthier! Fire Command 53 (7) 11-13

International Association of Fire Fighters (1997) The Fire Service Joint Labor Management Wellness/Fitness Initiative. Washington, DC: Author

International Association of Fire Fighters (1997) 1996 Death and Injury Survey. Washington, DC: Author

Jordan, P. (1995) Fitness Theory and Practice. (2nd ed.). Sherman Oaks CA: Aerobics and Fitness Association of America.

National Fire Protection Association. (1997) NFPA 1500: Standard for Fire Department Occupational Safety and Health Program. Ouincy, MA: Author

Ostrow, L.S., (1997) In Good Shape? Fire Service Wrestles with Physical Fitness Standards. Fire Rescue Magazine 15 (4) 84-92

Pearl, B. & Morgan, G.T. (1986) Getting Stronger. New York, NY: Random House, Inc.

Pearson, J., Hayford, J. & Royer, W. (1995) Comprehensive Wellness for Firefighters: Fitness and Health Guide for Fire and Rescue Workers. New York, NY: Van Nostrand Reinhold

Phoenix Fire Department, (1994) Phoenix Fire Department Health and Fitness Manual. Phoenix, AZ: Author

Stewart, P. (1979) U.S. Fitness Book. New York : Simon and Schuster

University of California, Berkeley (1991) The Wellness Encyclopedia: The Comprehensive Family Resource for Safeguarding Health and Preventing Illness. Boston: Houghton Mifflin Company