ORTHOPAEDIC

Physical Therapy Practice

THE MAGAZINE OF THE
ORTHOPAEDIC SECTION, APTA

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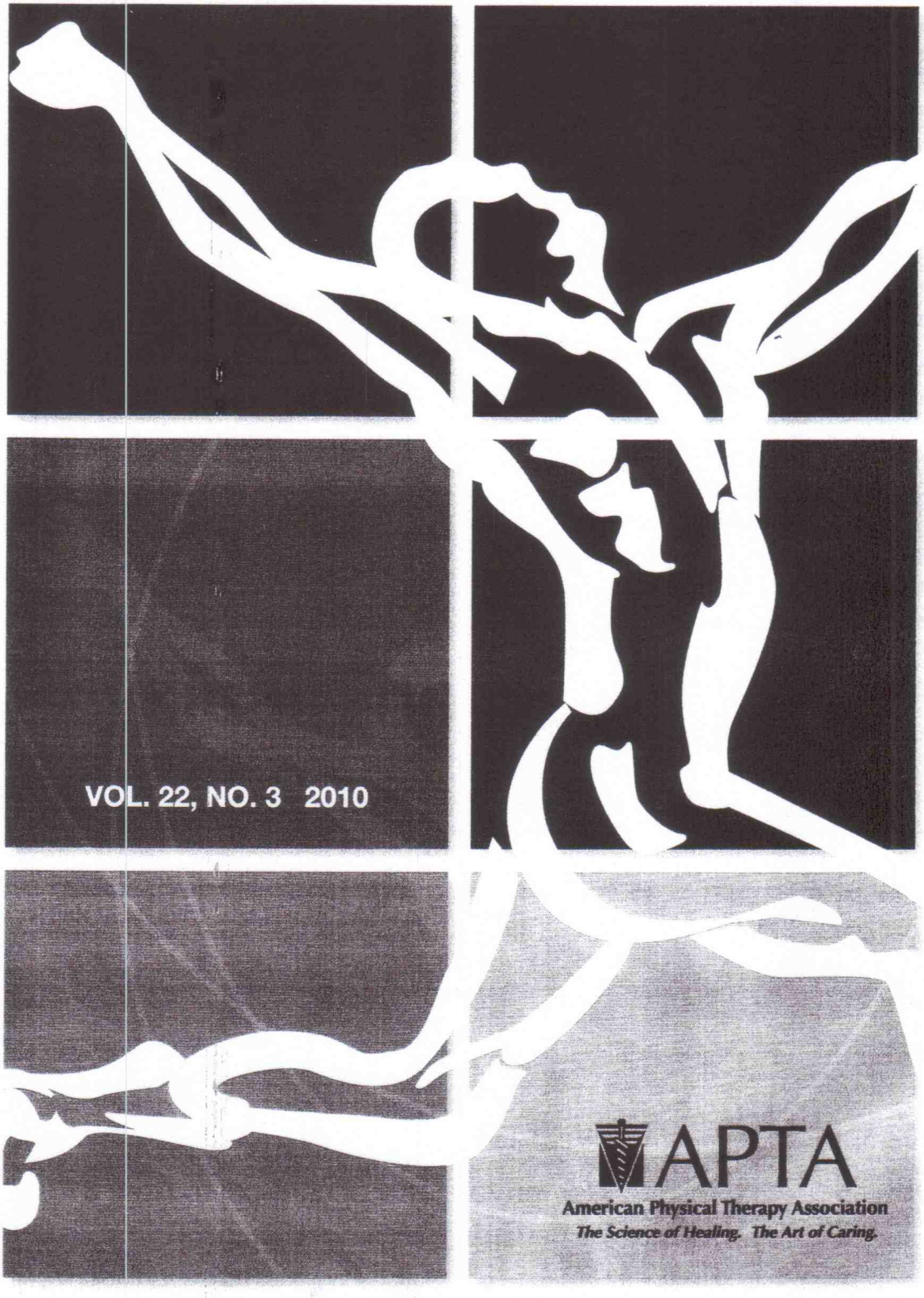

VOL. 22, NO. 3 2010

APTA
American Physical Therapy Association
The Science of Healing. The Art of Caring.

The Role of the Physical Therapist in Implementing A Firefighter Wellness Program

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ABSTRACT

Background and purpose: Physical performance requirements for firefighters with regard to strength and aerobic and anaerobic endurance are high. However, cardiovascular mortality and musculoskeletal morbidity is high and partly due to modifiable lifestyle related risk factors. The goal of this paper is to share the primary author's personal experience with setting up and managing a wellness intervention for the local fire department with the intent of informing other colleagues, who want to become active in this area of practice. **Methods:** Discussion of program content and results but also obstacles encountered along the way. **Findings:** Despite some unexpected obstacles, it would seem that the wellness program as it was implemented resulted in both increased levels of fitness for individual participants and considerable savings for the fire department. **Clinical Relevance:** Physical therapists seeking to expand services into the wellness area are ideally positioned to work to enhance firefighter wellness but they need to be aware of and deal with obstacles to implementation of a wellness program.

Key Words: wellness, firefighters, physical therapy, implementation, obstacles

INTRODUCTION

There are approximately 800,000 volunteer and 300,000 career firefighters serving their communities in the United States.[1] Physical requirements to adequately perform this vocation are very high. A generic job description holds that firefighters need to be able to stand and walk for an extended period of time, bend, stoop, push, pull, reach overhead, and carry a 200 lb person.[2] Providing more quantitative information, based on an analysis of demanding firefighter operations Gledhill & Jamnik[3] recommended a minimum VO2max of 45 ml/kg/min for firefighters. Based on a simulated person rescue exercise, Von Heimburg et al[4] proposed a minimum VO2max of 4 l/min. During high-intensity tasks firefighters also depend on high levels of anaerobic endurance.[5] In fact, anaerobic endurance as measured by a 400m run was found to highly correlate (r = 0.79) with overall job performance.[6] Not surprisingly, strength requirements are also high. Performance on a functional assessment tool specific to firefighting showed strong positive correlations with grip strength, maximal number of pull-ups and push-ups, and number of sit-ups performed in one minute.[7] Von Heimburg et al[4] noted that especially greater upper extremity strength led to increased functional performance.

In light of above physical requirements, data on firefighter fitness are likely surprising. With overweight defined as a body mass index (BMI) > 25 and < 30kg/m2, 60% of firefighters can be classified as overweight.[8] This is not a situation unique to the US fire service: A Canadian study reported that 9 ± 1% of firefighters was above the upper limit of ideal weight and that 53% had a BMI indicative of excessive weight. This study also found that in the participating firefighters HDL levels were lower and LDL and triglyceride levels were higher than the age-matched national average with total cholesterol levels considered indicative of the need for intervention.[9] However, factors other than these modifiable risk factors attributed to lifestyle also put firefighters at risk for cardiovascular disease. Occupational exposure to carbon monoxide has been implicated in the etiology of ischaemic myocardial damage and accelerated atherosclerosis and in the increased incidence of ventricular fibrillation.[10] Decreased ventilatory capacity has been directly correlated with exposure to firefighting action.[11] Therefore it should come as no surprise that of the 1,141 deaths between 1994-2004 in firemen while on duty (not including the 345 NYCFD firemen, who died on September 11, 2001), 50% of the volunteer firemen and 39% of career firemen were related to heart attacks. Furthermore, this most prevalent cause of death occurred most commonly in the 45 to 54 year old group.[1] Musculoskeletal injuries are also highly prevalent. For 2007, the National Fire Protection Agency (NFPA) estimated that 80,100 firefighters were injured with 52% of these injuries classified as sprains, strains, and muscular pain.[12]

At the national level within the fire service, firefighter fatalities due to sudden cardiac death with a large percentage also occurring off the fire ground have been recognized as a problem; and in 1997, a collaborative effort called The Fire Service Joint Labor Management Wellness/Fitness Initiative was started by the International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs to address this problem.[13] With the provision of wellness services clearly established within the scope of practice of physical therapy in the United States[14] and considering the potential of addressing the modifiable risk factors for both cardiovascular and musculoskeletal pathology prevalent in firefighters, physical therapists are well placed to be active in this area. The goal of this paper is to share the primary author's personal experience with setting up and managing a wellness intervention for the local fire department with attention to program content and results and obstacles encountered along the way with the intent of informing other colleagues, who want to become active in this area of practice.

PROGRAM CONTENT

In 2006 the primary author won a bid to develop and implement a wellness program for the local fire department. The program had 4 components: baseline and follow-up testing, a circuit-training program, a cardiovascular training program, and an educational component. If a participating firefighter had been cleared to work, they were considered able to participate in the program.

Baseline tests were the tests contained in the Candidate Physical Ability Test (CPAT) that has been described in The Fire Service Joint Labor Management Wellness/Fitness Initiative.[13] The CPAT consists of a comprehensive medical examination and a number of anthropometric and physical performance tests including resting blood pressure and heart rate, height, weight, The Siconolfi step test, 1-minute push-up, pull-up test, and sit-up tests, and the sit-and-reach flexibility test. Test results were discussed with participants and used in individualized goal setting. Firefighters were given the opportunity to be retested every quarter.

Mindful of the limited budget for purchase of exercise equipment and the fact that in this fire department alone 23 separate fire stations participated, each with 3 shifts, strength and anaerobic endurance requirements were addressed with a circuit-training program modeled after the Los Angeles Fire Department FFIT (Fire Fighter in Training) program that was developed in cooperation with the University of California at Northridge. The program included 24 one-minute stations alternating strength training with stretching exercises with 45 seconds to exercise and 15 seconds for switching stations. The whole circuit was to be completed twice during one workout session (Table 1). The participants stretching kept time calling out 20 seconds to switch sides when stretching and 45 seconds to change stations. Strength training exercises were chosen to specifically address muscle groups found in EMG studies to be most involved in firefighting activities.[15] Weight was self-adjusted by the participants with the intent of producing muscular fatigue at 45 seconds. The primary author provided poster boards with pictures and descriptions of all exercises and came to the fire stations upon request for additional instruction.

Because the circuit-training program did not produce an adequate cardiovascular training stimulus, a separate aerobic endurance was added. Again, participants were allowed to determine (and subsequently adjust) their exercise level using a bronze to platinum classification of self-rated aerobic fitness (Table 2) to which aerobic endurance activities were matched (Tables 3 and 4). Based on the retest results of the Siconolfi step test, the therapist also made recommendations on exercise level. The aerobic program was modeled on the requirement that a firefighter has to be able to run approximately 2 miles in 15 minutes, which is how long a compressed air bottle will last on average during firefighting action.

Optional for incumbents, the educational component required all cadets and new recruits to attend a class conducted by an exercise physiologist going over the firefighter fatality database and the CDC statistics on obesity and its impact on developing chronic diseases that might affect a fire fighter's career. The importance of starting and maintaining healthy exercise habits were discussed as well the role of good nutrition and a healthy lifestyle.

PROGRAM RESULTS

Of 230 firefighters, 186 (81%) participated in the baseline testing. Compared to relevant normative data,[16] average values for the physical assessment tests were depressed for the Siconolfi step test, 1-minute pull-up test, and sit-and-reach test; BMI was elevated. Blood pressure measurements showed that at baseline testing 44% of participants were pre-hypertensive (>120-139 mmHg systolic and/or 80-89 mmHg diastolic), 30% had stage I hypertension (140-159 mmHg systolic or 90-99 mmHg diastolic), and 3% were stage II (>160 mmHg systolic or >100 mmHg diastolic).[17] At follow-up testing, 110 firefighters (48%) participated. Baseline and follow-up testing data are provided in Table 5.

To determine economic impact, the primary author used data from the county Department of Risk Management that provided reports related to workers compensation injuries on the year prior to the initiation of the wellness program and for the year during which the wellness program was implemented. This year-to-year comparison showed a decrease in days lost by 41%, a decrease in claims by 19%, and a decrease in cost by 69% or $85,621.41 during the first year of the program (Figure 1). Recognizing the likelihood of confounding factors, we extended this comparison to the 4 years prior to implementation of the wellness program. Over this 5-year period, the total potential savings including backfill costs to replace the injured firefighters during their shift and excluding benefits was $349,084.40 (Figure 1). Although it was obvious that these savings could not be directly attributed in a cause-and-effect sense to the wellness intervention, this trend did provide sufficient support for continuation of the program.

Table 1. Circuit Training Program

Flexibility	Strength
1-Hamstring Stretch	2-Lunge Carry
3-Triceps Stretch	4-Push-up
5-Low back Stretch	6-Oblique Crunch
7-Quadriceps Stretch	8-Squat Press
9-Trunk Stretch	10-Horizontal Pull-up
11-Low Back/Cat Stretch	12-Back Extension
13-Groin Stretch	14-Lunge Carry
15-Chest Stretch	16-Push-up
17-Hips and Gluteal Stretch	18-Oblique Crunch
19-Lunge Hip Flexor Stretch	20-Squat Press
21-Posterior Shoulder Stretch	22-Horizontal Pull-up
23-Rotation-Low Back Stretch	24-Back Extension

Table 2. Self-Rated Aerobic Fitness Classification

	Bronze	Silver	Gold	Platinum
Current exercise level	3 or more days per week	3-5 days per week	5 or more days per week	5 or more days per week with interval training
Target heart rate (age predicted maximum)	60-70%	70-80%	70-90%	70-90%
Predicted VO_2max	26-33ml/kg/min	34-43ml/kg/min	44-52 ml/kg/min	53 ml/kg/min

OBSTACLES AND LIMITATIONS OF PROGRAM IMPLEMENTATION

Implementation of the wellness program encountered a few obstacles. At baseline testing the therapist had no access to findings from the medical examination because firefighters were concerned that disseminating such data might negatively affect their active duty status. The primary author had to establish relationships with fire chiefs and other administrators, the union, and the firefighters to gather some data that would not violate HIPAA privacy rule regulations yet still provide for establishing safe testing limits. Approval was given to have participants fill out a personal fitness and lifestyle goals questionnaire and an exercise habits and interest questionnaire both to gain insight into exercise history and to help tailor the program somewhat to exercise interest of the participants.

With regard to basic medical information and as noted in the program content section, the initial instruction was that if the individual had been cleared to work, that they should be considered able to participate in this program. Concerned that this was insufficient information to assure safe testing and participation, the primary author was able to get permission to have participants fill out the Physical Activity Readiness Questionnaire (PAR-Q), which has been proven reliable for flagging individuals between the ages of 15-69, who need to see a physician before beginning the testing or exercise components of this program.[18] If any participant had a positive variable on the PAR-Q, he or she had to receive medical clearance before participating in the fitness program testing. If the item scored was of a musculoskeletal nature, the therapist evaluated the individual to determine if participation was safe or needed modification. Most firefighters who had a finding on the PAR-Q requiring a referral did follow up with a physician.

The most significant obstacle had to do with the unexpected elevated blood pressure findings. The department had to come up with a policy regarding testing and exercise participation. It was decided that a firefighter with stage I hypertension was not to be further assessed, his district captain notified, who then together with the health and wellness officer determined impact on active duty status. A firefighter with stage II hypertension was sent to the employee health clinic, where duty status was then determined. With 33% of initial participants registering as stage I/II hypertensive, we suddenly had a large number of firefighters not wanting to participate fearing that they would be taken off duty. Letters from the local IAFF union president, medical director, and division and fire chiefs were solicited to assure participants that the findings would not result in punitive action and that the wellness program was in the best interest of the firefighter and proposed as a nation-wide initiative by *The Fire Service Joint Labor Management Wellness-Fitness Initiative.*[13] To an extent, this helped set aside fears and testing. Exercise participation continued, although it certainly may have affected long-term participation as noted by the decreased participation rate at retesting.

Table 3. Cardiovascular Walk-to-Run Training Program Bronze and Silver Levels

1. Slow walk for two miles in 40 minutes.
2. Alternate ¼ mile slow walk and ¼ mile fast walk for 36 minutes.
3. Fast walk for two miles in 32 minutes.
4. Alternate 330-yard fast walk and 11-yard slow jog for 29 minutes.
5. Alternate 220-yard fast walk and 220 yard slow jog for 26 minutes.
6. Alternate ¼ mile fast walk and ¼ mile slow job for 26 minutes.
7. Alternate ½ mile slow jog and ¼ mile fast walk for 23 minutes.
8. Alternate ¾ mile slow jog and ¼ mile fast walk for 23 minutes.
9. Slow jog continuously for 20 minutes.
10. Alternate ¼ mile fast jog and ¼ mile slow jog for 19 minutes.
11. Alternate ¼ mile slow jog and ¼ mile fast jog for 18 minutes.
12. Alternate ½ mile and ½ mile fast jog for 18 minutes.
13. Alternate ½ mile fast jog and ¼ mile slow jog for 17 minutes.
14. Alternate ¼ mile slow jog and ¾ mile fast jog for 16 minutes.
15. Fast jog continuously for 16 minutes.
16. Alternate ¼ mile fast jog and ¼ mile faster jog for 15 minutes.
17. Alternate ½ mile fast jog and ½ mile faster jog for 15 minutes.
18. Faster jog continuously for 14 minutes.

Table 4. Cardiovascular Interval Training Program Gold and Platinum Levels

	Activity	Time	Distance
1	Warm-Up		
2	Fast run	3:15-3:30	0.5 miles
3	Walking recovery	3:00	
4	Fast run	3:00-3:15	0.5 miles
5	Walking recovery	3:00	
6	Faster run	1:10-1:20	0.25 miles
7	Walking/jogging	3:00	
8	Faster run	1:00-1:20	0.25 miles
9	Walking/jogging	3:00	
10	Faster run	0:30-0:45	220 yards
11	Jogging	1:30	
12	Faster run	0:30-0:45	220 yards
13	Jogging	1:30	
14	Faster run	0:15-0:20	110 yards
15	Jogging	0:45-0:60	
16	Faster run	0:15-0:20	110 yards
17	Jogging	0:30-0:40	
18	Faster run	0:15-0:20	110 yards
19	Jogging	0:20	
20	Fastest run	0:10-0:15	55 yards
21	Jogging	0:20	
22	Fastest run	0:10-0:15	55 yards

CONCLUSION

Despite some unexpected obstacles it would seem that the wellness program as it was implemented resulted in both increased levels of fitness for individual participants and considerable savings for the fire department, although we recog-

nize that confounding factors abound and that a cause-and-effect relationship cannot be established. Key lessons learned by the primary author included the need for a greater emphasis within a wellness intervention on education with regard to modifiable life style-related risk factors due to the impact this might have on cardiovascular morbidity and mortality but also the need to work closely with local government officials, unions, fire service administration, and medical providers to maintain good communication. A proposed solution that would improve such communication and allay participant concerns would be to have an employee/peer from within the fire service coordinate this program. An individual who understands the inner workings of the fire service from job demands to job politics can act as a liaison between outside contractors, such as an exercise physiologist, physical therapist, or other medical providers, and the various entities involved in making decisions regarding a wellness program.

Physical therapists may seek to expand the services they offer into the area of wellness not only because it provides a source of revenue independent of shrinking third-party payer reimbursement but also because with their knowledge and expertise many are ideally suited to take this role (although some might consider additional training in the area of wellness and fitness). In 2002, an impact study of the *Fire Service Joint Labor Management Wellness-Fitness Initiative* was done in Florida.[19] This study found that the firefighters' mentality is that fatalities are the nature of their business. If fatalities are the cost of doing business, then the price paid by the Fire Service has been staggering. Nationally there are over 33,000 organized fire departments and historically the fire service has known more about the apparatus and equipment it purchases than about the firefighters who use it.[13] There is a role for the physical therapist in this regard to act as a much-needed advocate for change for the people who in serving our communities put their lives on the line.

ACKNOWLEDGEMENT

This paper was written in partial fulfillment of the requirements for the transitional Doctor of Physical Therapy degree of the primary author at the University of St. Augustine for Health Sciences. The authors would like to thank Ms. Deb Monkman, librarian for the Physiotherapy Association of British Columbia, for her help with retrieving references for this paper.

Table 5. Baseline and Follow-up CPAT Test Data

	Baseline	Follow-up	% Change
Scinolfi step test (ml/kg/min)	34.6	37.4	+8.1
Push-up test (reps)	33	38	+15.2
Sit-up test (reps)	47	62	+32
Sit-and-reach test (inches)	11.97	16.33	+36.4
Pull-up test	5	6	+20
Body Mass Index	27.3	27.6	+1.1

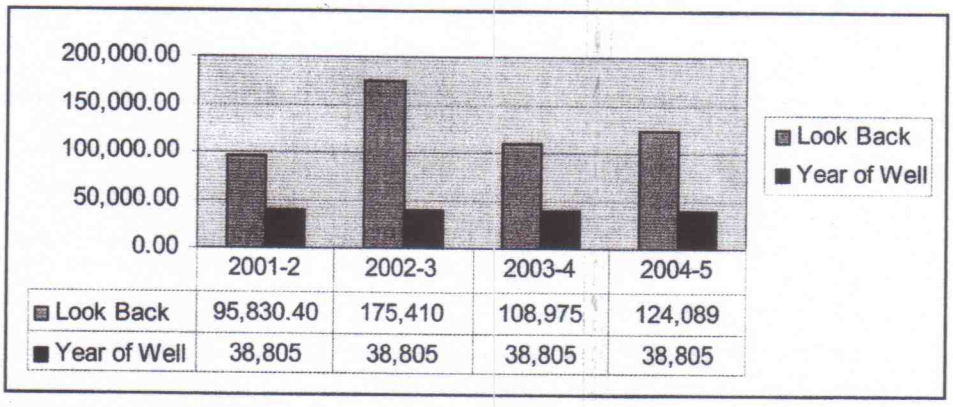

Figure 1. Cost comparison (in dollars) against year with wellness intervention.

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MARK YOUR CALENDARS

National Student Conclave 2010
October 29-31, 2010
Cherry Hill, NJ

Combined Sections Meeting 2011
February 9-12, 2011
New Orleans, LA

CSM MEETING MINUTES ERRATUM

The CSM Meeting Minutes published in the last issue of OP will be corrected with the statement below.

Susan Appling, PT, PhD, OCS, PT-PAC Trustee, gave an update on the PT-PAC fund raising efforts. Susan explained that the Section cannot make contributions directly to the candidates but individual members of the Section can make contributions to the PT-PAC who can then contribute to the candidates.