2004

Comprehensive Core Strengthening Program for Firefighters

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Comprehensive Core Strengthening Program for Firefighters

by

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Scholarly Project

Submitted to the Occupational Therapy Department

of the

University of North Dakota

In partial fulfillment of the requirements

for the degree of

Master in Occupational Therapy

University of North Dakota
Casper College Site, Casper Wyoming
December 2004

Approval

This scholarly Project Paper, submitted by Christy Siplon in partial fulfillment of the requirement for the Degree of Master's of Occupational Therapy from the University of North Dakota, has been read by the Faculty Advisor under whom the work has been done and is hereby approved.

Faculty Advisor

6-6-05
Date

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Department: Occupational Therapy

Degree: Master's of Occupational Therapy

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CHAPTER ONE

INTRODUCTION

Back pain is one of the most pervasive medical problems in our society (Muir, T.W., 1994, p. 66). According to the Bureau of Labor Statistics, "more than one million workers suffer back injuries each year, and back injuries account for one of every five workplace injuries or illnesses" (Occupational Safety and Health Administration (OSHA), 1993, p.1). A staggering "80 to 90 percent of all Americans will suffer lower back pain at some point in their life" (Muir, T.W., 1994, p. 66). Of the individuals who suffer from lower back pain, "20% will become chronic, interfering with work" (OSHA, 1993, p. 1).

Low back pain is reported the most expensive healthcare cost in America. In 1998, "eight billion dollars a year can be directly attributed to the treatment of lower back problems" (Holmes, 1998 p. 1). This number has increased significantly, according to National Strength and Conditioning Association (NSCA, 2001) back injury costs are approaching 100 billion dollars annually. That is an enormous amount of economic damage to this country, its workers and its jobs" (Industrial Back School, 2004, P. 15; Jenkins, 2003).

Preventing back injuries is a major workplace safety challenge. For the purpose of this scholarly project, the focus will be on the occupation of a firefighter. "Back injuries are the most prevalent injury due to all the demands placed on a firefighter's

body" (Pettit, J.L., 2004, p. 3). According to the International Association of Fire Fighters (IAFF, 1998), "sprains and strains were the leading on-duty injuries, 43.9%, with the highest being injuries to the back, 44.7%" (p. 11).

> According to the 1997 Death and Injury Survey, "more than 40 percent of all fire fighters suffered a job-related injury in 1997, far exceeding the rate of injury for every other occupation. Firefighters are nearly six times more likely to suffer on the job injuries than average private-sector workers" (International Association of Fire Fighters (IAFF), 1998, p 5.).

Firefighters place a great deal of stress on the low back by the difficult tasks they undertake in the line of duty such as lifting and carrying heavy or awkward loads in dangerous situations.

A needs assessment was conducted at Casper Fire Department (CFD) between May 2003 and May 2004. The results of the needs assessment indicated that most firefighters have not been sufficiently trained regarding back and abdominal exercises. Due to a lack of this training the firefighters are not benefiting from improved core strength and in turn are experiencing a high occurrence of back injuries. For data details, please see Appendix D and E. More than likely these factors contributed to the CFD spending a total of $87,156.91 on back injuries during the period of 2002 through 2003.

A Core Strengthening Program and the YMCA *HealthyBack Program* were researched for their appropriateness and implementation at the CFD stations. These programs concentrate on strengthening the back and abdominal muscles in conjunction with increased flexibility to decrease the rate of back injuries. Core strengthening has been proven to increase back and abdominal strength, balance, posture, flexibility and

improve back pain and fatigue indicated in physically demanding occupations like firefighting. According to Lowe, 1997, when your heart and lungs are strong from regular exercise, your muscles will get oxygen more easily. This makes the firefighter fit and allows him or her to do more work with less effort. It also allows the muscles, including the back muscles, not to fatigue as easily or as quickly, and thereby preventing future back injuries.

The review of literature and the results of the needs assessment revealed that the Core Strengthening Program and/or YMCA *HealthyBack* is an strong exercise routine for CFD firefighters to assist in decreasing the occurrence of back injuries. *Workers' Comp Managed Care* from May 2001 reports that the prevention program *HealthyBack* "has consistently reduced low back injuries and related workers' compensation costs by more than 75%" over the past five years of implementation at one company (Workers' Comp Managed Care, 2001). Throughout the history of the fire service the proper implementation of fitness programs in fire departments has been widely debated. Repeatedly, research has shown the need for high levels of core strengthening, aerobic fitness, muscular endurance and muscular strength to perform safely and effectively in the fire service (Lowe, 1997). In the fire service, having a strong "core" is going to be one of the most essential assets to help prevent back injuries.

One area not consistently nor adequately addressed is the psychosocial/emotional issues related to being a firefighter. This is an issue on several different levels such as: a) being in a dangerous occupation facing considerable personal risks on a daily basis, b) the impact on family life in general and c) the impact of injury on the individual and

family should one occur. Back injuries not only affect an individual, it can also affect his or her vocation and family, leading to frustration, anger, depression and emotional stress.

The goal of this scholarly project was to research and formulate a program to reduce and prevent back injuries and increase the quality of life for the firefighters of the CFD. The goal of this project was successfully met which can be seen in Chapter IV. Through the examination and analysis of the fitness program at the CFD, it is concluded that occupational therapy services would be beneficial in reducing work related injury costs. Occupational therapy is critical to ensure CFD firefighters attain and maintain core strength and quality of life. The occupational therapist (OT) has professional skills that allow identification of behaviors and practices that contribute to back injuries. The OT is key since he or she can not only oversee the exercise training and education they are also trained to identify harmful work habits, poor job design through ergonomic and job analysis evaluations. An OT can design and implement a comprehensive, integrated program that focuses on injury prevention and wellness by identifying and eliminating risk factors related to back injury and the resulting stress so the direct and indirect costs are minimized for the individual, the department and the community.

CHAPTER TWO

LITERATURE REVIEW

The back is one of the most neglected parts of the body in terms of maintaining fitness, strength and flexibility. People tend to take their back for granted, until it starts to give them pain. "The majority of back problems build gradually and progress through the accumulated effects of poor posture, faulty biomechanics, stress, loss of flexibility, and a lack of physical conditioning" (Pearson, Hayford & Royer, 1995, p. 163). According to *The Doctor's Medical Library*, "backache is the most common presenting complaint in medicine" (Kennedy, 2004).

The National Institute for Occupational Safety and Health (NIOSH, 1997) reports that "back injuries account for nearly 20% of all injuries and illnesses in the workplace and back injury claims cost the nation an estimated 20 to 50 billion dollars per year" (NIOSH, 1997). Eighty percent of all Americans "will miss at least one week of work in their lifetimes" due to low back pain (Holmes, 1998, p. 1). "Approximately five million Americans will suffer from back pain, which accounts for over 90 million lost in production days annually" (NSCA, 2001). According to Pettit, (2000, p. 1) "So much work and money is lost treating back pain and musculoskeletal disorders that the Occupational Safety and Health Administration (OSHA) has developed ergonomic standards in the workplace."

Significant statistics support the need for an injury prevention program and for the purposes of this paper, specifically a program focusing on back injury. The first step in the back injury prevention process is to have a clear understanding of the anatomical and functional processes of the back.

Anatomy of the Back

As stated prior, the back is one of the most neglected parts of the body. The anatomy of the back consists of vertebra, disc, joints ligaments, muscles and nerves. The spine consists of several small blocks of bone stacked on top of each other. It is an extremely difficult mechanical challenge for the spine to maintain posture, maintain loading stability and still be flexible and mobile. This mechanical challenge is what leads to fatigue and eventually an injury (Martini, Ober, Garrison, Welch, and Hutchings, 2001; Grindel, Crowley and Johnston, 1997; Industrial Back School, 2004).

Vertebrae

"The spine is actually a flexible chain held upright. Each link in that chain is a vertebra" (Industrial Back School, 2004, p.32; Kolber & Zepeda, 2004). The vertebra of the spine has two basic functions, stable posture and mobility. Maintaining these two basic functions is a difficult mechanical challenge. The spine is divided into three areas, cervical, thoracic and lumbar. There are seven cervical vertebrae, the first of which articulates with the skull. There are twelve thoracic vertebrae that articulate with the ribs and the five lumbar vertebrae. (Martini, et al., 2001; Grindel, et al., 1997). An individual vertebra is made up of several parts. The body of the vertebra is the most important area of weight bearing and provides a resting place for the discs which separate

each of the vertebrae. There is a large hole in the center of the vertebra through which the spinal nerves pass (Martini, et al., 2001; Grindel, et al., 1997). The spinous processes are the bones you can feel when running your hands down your back and these bones provide attachment for the back muscles (Martini, et al., 2001; Grindel, et al., 1997).

Disc

The disc is a critical component in the spine and is a common source of extremely serious and disabling back problems. The disc is located between the vertebrae in the front part of the spine and performs two functions. The first function is to help control the bending spine and the second is to act as shock absorbers between the vertebrae. The discs help to absorb the shock of the feet striking the floor as we walk around (Industrial Back School, 2004; Martini, et al., 2001; Grindel, et al., 1997; Kolber & Zepeda, 2004). They also help to cushion the spine when lifting, pushing, pulling, carrying, bending, twisting or sitting. The disc is made up of two parts. The hard tough outer layer called the annulus surrounds the center named the nucleus.

> "The nucleus acts like a ball bearing that the vertebrae can roll on. The vertebrae roll over the top of this nucleus as it bends in various directions. This nucleus maintains a constant space, a constant distance between the vertebrae so that the ligaments and muscles moving and holding the spine have stability in most all positions and movements (Industrial Back School, 2004, p.38; Kolber & Zepeda, 2004).

When bending forward the vertebra rolls over the front wall of the nucleus and the front of the disc is compressed, while the back wall of the disc is stretched (Industrial Back School, 2004; Kolber & Zepeda, 2004). This is where problems can arise since the

back wall of the disc is capable of stretching only so far. If forced to stretch any further for a prolonged period of time, or with twisting or bending, this back wall may rip open. This is then diagnosed as a ruptured disc (Industrial Back School, 2004; Kolber & Zepeda, 2004).

As the spine bends backwards, it compresses the back portion of the disc, the front of the disc gaps wide; this allows fluids to be drawn into the disc. These fluids contain the nutrition the disc needs to feed and maintain itself. This movement also tends to push the nucleus toward the front wall of the disc. There is not much worry about the disc in this position and researchers believe it actually helps to feed the disc (Industrial Back School, 2004; Kolber & Zepeda, 2004) This backward position can actually be good for the disc.

Joints

The joints are one of the most important parts of the spine. A joint is where two bones pivot on one another (Industrial Back School, 2004; Martini, et al., 2001; Grindel, et al., 1997). These joints are extremely sensitive and are filled with nerve endings that sense movement, position and weight bearing. It is the sensitivity of these nerve endings in and around these joints that allows us, as human beings, to stand upright on two feet. The sensitivity of these nerve endings, however, can work against the joints. It does not take much mechanical stress and strain to irritate these nerve endings so that pain is felt. Once pain persists and becomes firmly established, it is often diagnosed as chronic pain (Industrial Back School, 2004; Jenkins, 2003).

Ligaments

The vertebrae are linked together by ligaments and muscles, which directs the degree of flexibility of the spine. "Ligaments are very powerful straps of connective tissue that completely surround nearly all parts of the spine and hold the vertebrae together" (Industrial Back School, 2004, p. 43; Martini, et al., 2001). The ligaments are designed to protect the spine in all directions. "Bending in any directions usually pulls some ligament tight. Move to far, and you sprain that ligament" (Industrial Back School, 2004, p. 44; Kolber & Zepeda, 2004).

Muscles

The muscles are an extremely important part of the spine. It has long been suspected that the muscles of the spine are weak, in light of the fact that eight out of ten people hurt their back. Research has shown this assumption to be untrue; the muscles in the lower back are actually the strongest muscle group in the entire body (Industrial Back School, 2004; Jenkins, 2003). The deep back muscles play an important role in controlling the joints between the vertebrae of the spine. The small deep muscles steady the spinal column so that the long muscles of the back can be used as a lever for bending and twisting the torso (Martini, et al., 2001; Kolber & Zepeda, 2004; Jenkins, 2003).

Nervous System

The nerves in the spine are a sensitive structure; they are extremely strong, coordinated and well balanced. The nerves in the back require sensitivity so that they can sense flexibility, strength, position, balance and movement (Industrial Back School, 2004; Martini, et al., 2001; Grindel, et al., 1997).

The spinal cord passes down through small openings called foramina and it also carries all the nerves messages from the brain to the rest of the body. The nerve fibers branch off the spinal cord to form pairs of nerve roots. These nerves connect to other specific parts and tissues of the body. This is why damage to certain areas in the spinal cord can cause paralysis although; it depends on where the damage has occurred as to what body parts will be affected. Damage or irritation to the nerves themselves can cause pain, tingling and or numbness (Martini, et al., 2001; Grindel, et al., 1997). If the nerves in the cervical area of the spine are damaged, then the upper chest and arms will be affected. If the thoracic part of the spine is damaged then the chest and abdomen will be affected. If the lumbar region is damaged then the legs, bowel and bladder will be affected (Martini, et al., 2001; Grindel, et al., 1997).

Once there is an understanding of the anatomical and functional processes of the back, it is necessary to apply these to the demands of the occupation. This allows the therapist to determine what interventions are needed to increase the success of the worker; the firefighter.

Firefighters

The fire services greatest asset is not equipment, apparatus or stations, but rather its firefighters. When firefighters are ill, injured, overweight or stressed, it affects their ability to effectively do their job. It is through the firefighter that the departments serves the public, accomplishes their missions, and are able to make a difference in their communities (IAFF, 1997; Shell, 2003).

A firefighter's job description includes, but is not limited to; lifting, caring heavy objects, transferring people, strenuous bending, manipulating heavy equipment and many

other physically taxing duties. The physical activities of a firefighter require above average strength. "Several studies and job analysis have shown that the weight of equipment used by a firefighter is in excess of 100 pounds" (IAFF, 1997, p. 55). Many of these tasks must be completed in full gear, which adds bulk and 60 pounds of equipment. In the firefighting career there can be an injury at any moment with the possibility of; slips and falls, dropping a ladder, picking up a client in an awkward position, advancing hose in the middle of the night without warm-up, lifting apparatus off the fire truck and many other unsafe possibilities (Coaches Corner, 2004). Firefighting is also considered one of the most physically and emotionally challenging careers (Lowe, 1997).

Many of the emotional challenges that firefighters experience are internal and external stressors. These stressors include irregular work hours, sleeplessness, and time management; as firefighters respond from inactivity to vigorous activity within seconds. They also encounter unusual and disturbing situations such as dealing with attempted suicides, survivors of vehicle accidents, and structure fires. Firefighters view stress as a normal part of the job and see themselves under more stress today than their colleagues were ten to twenty years ago (Shell, 2003).

Physical Testing

Physical fitness is important for all firefighters; it is crucial to test their ability to perform such activities as emergency medical situations, hazardous materials response, rescue, or fire investigations. As discussed prior, many lifting and carrying tasks are associated with being a firefighter. Injury is more likely to occur in workers that are not capable of performing lifting or other physically demanding tasks (Shell, 2003). In order

to ensure CFD firefighter's abilities to carry out their duties safely and effectively, they are required to under go physical fitness testing bi-annually. There are two fitness tests the CFD firefighters are required to perform; the fitness evaluation and the combat task test. These tests are scheduled six months apart from one another.

Fitness Evaluation

The fitness evaluation is performed in the fall and its purpose is to determine the firefighter's physical fitness level and identify areas in need of improvement in order to pass the firefighter's combat task test. The fitness evaluation is a contractual obligation, which firefighters agree to complete when they are hired at CFD. CFD fitness coordinators facilitate the fitness evaluations. The fitness coordinators have all participated in the *Health Metrics, Inc* Physical Fitness Coordinator program. The program is a 40 hour class and the participants receive training in the following topics: implementing and managing organization-wide fitness programs, administering health risk appraisals, conducting fitness assessments, designing and monitoring of individualized fitness programs and the implementation of weight management and other health promotion/wellness strategies. The fitness evaluation tests aerobic capacity, muscle strength, flexibility and muscle endurance. The results of the fitness evaluation are compiled and evaluated by the fitness coordinator. They are then passed on to the participant. It is left up to the participant to approach the fitness coordinator if they would like specific suggestions to address areas in need of improvement. A skilled OT would be beneficial in collaborating with the fitness coordinators and the participants to ensure proper implementation and oversee the behavioral and overall physical health of firefighters.

Combat Task Test

The combat task test is performed in the spring and is the physical fitness test which determines firefighter's continuing employment at the CFD. Firefighter's that fail the test are flagged a "fitness failure" and they are ineligible for promotion or to participate in time trades (the trading of work shifts with another firefighter). If the firefighter cannot successfully pass the combat test within 90 days from the original failure date, they could be subject to termination.

In the combat task physical fitness test, the firefighter is fully bunkered (dressed in full gear) and breathing from a self-contained breathing apparatus (SBCA). The test begins with the firefighter carrying a high rise hose pack weighing 45 pounds up five flights of stairs. On the fifth floor, the firefighter drops the hose pack and hoists a hose roll weighing 50 pounds up to the fifth floor using a rope. After completing this task, the firefighter runs down the five flights of stairs (touching each step on the way down). He/she then exits the tower and moves to the Kaiser sled. The Kaiser sled is a machine used to simulate cutting through a roof with an ax. In order for the simulation to be accurate, the firefighter uses a nine pound dead blow sledgehammer to repeatedly strike a 175 pound beam and displace the beam four feet. The firefighter then walks a preset path (100 feet) to pick up a charged (with water) hose line that measures one and three quarter inches in diameter and drags it 75 feet. After dragging the hose he/she must turn the nozzle and release water to prove that the hose is charged. The hose is then dropped and the firefighter proceeds to the final task, rescuing a 175 pound dummy, which must be dragged 100 feet. The entire test from start to finish must be completed in fewer than seven minutes.

It was stated earlier that a firefighter carries an excess of 100 pounds, so it is extremely necessary that they are in top physical condition for both their safety and the safety of the citizens. Firefighters who exercise are in better shape, have better aerobic conditioning and have a reduced risk of low back injury. This aspect is critical considering the numerous risks the firefighter can face on a daily basis.

Risks and Back Injuries for Firefighters

Over 90% of all back injuries are not caused by a sudden trauma (Pearson, 1995, p. 164). These injuries are the result of many years of a micro damage that accumulates, "caused by poor posture, improper body mechanics, and poor lifting techniques" (Pearson, 1995, p. 164). Given the intense physical demands, being a firefighter is one of the most grueling careers one can enter. "Back strain or injury is common due to all the demands placed on the firefighter's body. However, in many cases back injuries can be prevented" (Lowe, 1997, p.8).

The occupational hazards of the fire service have the highest injury producing factors of any professional working arena. "Firefighters are nearly six times more likely to suffer on the job injuries than average private-sector workers" (IAFF, 1998, p.5). Back injuries in the fire service have reached epidemic proportions (IAFF, 1997). "Back injuries are the most prevalent injury due to all the demands placed on a firefighter's body" (Pettit, J.L., 2004, p. 3). According to the International Association of Fire Fighters (IAFF, 1998), "sprains and strains were the leading on-duty injuries, 43.9%, with the highest being injuries to the back, 44.7%" (p. 11). Back injuries were also the leading cause of premature departures and job related injury retirements (IAFF, 1997). In addition to the pain and loss of professional fire service personnel, the medical, Worker's

Compensation premiums, and replacement costs, are forcing cutbacks in needed new fire service operation, staff, and equipment. Rather than risk the loss of such vital services, it is imperative that the focus move quickly to the prevention of injuries and a comprehensive approach be designed and implemented.

Prevention Programs

The purpose of a prevention program is to focus on intervention and develop support to improve the firefighter's performance as well as reaching their targeted outcome. Economic and business experts have warned business leaders that, "they must implement injury prevention programs [similar to the "ergonomics" rule, *HealthyBack*, and other programs] immediately, or face exploding workers' compensation costs" (Workers' Comp Managed Care, 2002, p.10). Prevention of back injuries has become the focus of occupational regulations indicating education in ergonomics and physical fitness. Workers' Compensation experts say, "Preventing and managing workers' ergonomic risks [including back injuries] requires employers to take a proactive-rather than reactive-approach." (NIOSH, 1997) According to Rosanne Danner of DuPont Safety Resources, "Prevention is the only sure way to avoid workers' compensation costs." (Workers' Comp Managed Care, 2002).

Flexibility

Flexibility is an important component of a prevention program and is the functional measure of the range of motion (ROM) of a joint (Kolber & Zepeda, 2004). It is dependent on the pliability of the surrounding tissues (i.e. muscles, tendons, ligaments). Good flexibility is important for everyone engaged in dynamic activity, but particularly essential for those whose jobs that require lifting, reaching, climbing and

other tasks where their bodies bend and move beyond normal ranges. Although the effect of increasing flexibility on performance is controversial, it is widely accepted that a lack of flexibility is a major contributor to injuries. Joint and limb restrictions may influence essential dynamic movements, balance, coordination, and muscular work efficiency (IAFF, 1997). When a joint has deficient flexibility, that particular joint is unable to move through its normal ROM. Once this occurs, other surrounding joints must compensate to perform necessary activities. This biomechanical compromise may lead to injuries and/ or additional injuries.

"Some studies suggest poor flexibility, especially a lack of flexibility in the low back and hamstrings, is associated with an increased rate of injury" (O'Connor, 1996, p. 22; Kolber & Zepeda, 2004). Low levels of flexibility can be a contributing factor relating to the following statistics. Hilyer, et al. (1990) studied the effect of flexibility training on the occurrence and complexity of joint injuries of 469 firefighters. Participants were divided into two groups, 251 firefighters participated in a mandatory flexibility program and the remaining 218 were left to their own volition. The firefighter fitness coordinators were trained in a series of flexibility exercise for the lower back, hamstrings, shoulder muscles, and members of the mandatory flexibility group were required to perform the designated flexibility exercises for 30 minutes each duty day. "The data indicated that injuries in the mandatory flexibility group were less costly in lost time at work" (p. 636) and provided data that flexibility intervention can decrease the severity of musculoskeletal injuries. Both of the proposed prevention programs include flexibility as an addressed component. The two prevention programs that will be

presented in the following sections are The YMCA *Healthy Back* Program and a Core Strengthening Program.

YMCA *HealthyBack* Program

The YMCA has offered the *HealthyBack Program* to millions of people across the USA since 1974. In 1994, the *HealthyBack Program* was updated to include current developments in exercise technology for better strength, endurance and flexibility of the back musculature. The principle *HealthyBack Program* is designed as a preventive course and includes a total of 20 exercises, presented in three levels of progression, from simple to more challenging and it is "a clinically proven exercise program that isolates and strengthens the low back muscles." (Workers' Comp Managed Care, 2001, p. 10). It also includes a more remedial secondary program for more deconditioned participants.

Core Strengthening Program

Core strength is the ability to maintain stability and proper alignment of proximal body parts during movement. The core muscles include not only the abdominals and back muscles but also the muscles in the pelvic floor and hips. The abdominal muscles are the main focus of attention as they take the pressure off the back and pull other abdominal muscles into place to enhance the stability and alignment of the core.

The core strengthening program is a three phase program that concentrates on strengthening the abdominals muscles, increasing flexibility and strengthening the lower back muscles to decrease the rate of back injuries. Flexibility is addressed in all three phases of the core strengthening program. Core strengthening is a personal commitment that all firefighters must make to survive and to sustain a career in the professional fire service. A Core Strengthening Program is critical in reducing and controlling the

preventable back injuries to firefighting personnel but it needs to be in combination with other measures to increase success. The strengthening portion is one small piece of a holistic program. Another measure of an intervention program is ergonomics.

Ergonomic Program

"The word ergonomics is derived from the Greek words 'ergon' (work), and 'nomos; (law). In the United States, the term human factor engineering is often used" (Weerdmeester, Dul, 1994, p. 1). Ergonomics is the design of a job that requires the human body to perform and carry out the occupation (LeCuyer, 1994).

Many injuries are a result of poorly designed job tasks that prevent the worker from performing the occupation, or job task, that they are required to do (Industrial Back School, 2004; Shell, 2003). Performing job tasks that are poorly designed for the human body can result in an injury or injuries that may prevent the firefighter from participating in the things in life that he/she likes to do, wants to do, or needs to do such as; their job, their activities of daily living, and their leisure interests. The Occupational Safety and Health Administration has been trying to take the proactive approach through implementing an "ergonomics" rule. This rule did not pass in 2000 under the current administration but proponents of the rule are still trying to push it forward. According to the Fairfield County Business Journal, "OSHA estimates its proposed 'ergonomics' rule," which would implement occupational techniques to avoid back and other injuries "will cost about $4.2 billion a year" (Fairfield County Business Journal, 2000, p. 4). This estimate is significantly lower than the current back injury claims estimates of 20 to 50 billion dollars per year (NIOSH, 1997).

"Injuries have had a devastating impact on private industry. To minimize the effects of injuries, private organizations have implemented ergonomics programs" (Kowahl, 1999). These organizations are being proactive by incorporating ergonomic programs due to the growing amount of research supporting the savings of the program in manpower and in costs. Proper workplace ergonomics complemented by a sound fitness program can play a key role in an injury-prevention program (LeCuyer, 1994). It is this proactive approach that is being presented to the Casper Fire Department (CFD).

Casper Fire Department

In serving the City of Casper, the CFD is a full service department that is required to maintain a high level of physical fitness which is tested bi-annually. The seventy firefighters of the CFD are conscientious and fitness minded. Within their daily schedule, an hour and a half of duty time is dedicated for fitness training. Prior to involvement in any exercise routine, all firefighters must be medically cleared to participate. To efficiently utilize the prearranged exercise time, each of the five CFD stations is equipped with adequate equipment to include free weights, therapy balls, benches and treadmills. Any fitness questions a firefighter might have can be directed to one of the five fitness coordinators of the CFD. When on duty, the firefighters follow a training schedule to include such activities as; tower drills, staff meetings, physical exercise, fire training with live burns, inspections, apparatus meetings, standby emergency services, cardio pulmonary resuscitation (CPR) education, daily house chores, and many other important training exercises.

The back is a physically powerful but sensitive mechanism with many moving components. In order for the CFD firefighters to attain optimal job performance,

according to the occupational therapy framework, the following areas must be utilized; work habits, appropriate behaviors, and compliance with norms. In the CFD workplace, this includes ergonomics, correct body mechanics, and compliance with all CFD policies. The presence of a strengthening facility and equipment at each station does not ensure that every firefighter is doing the proper exercises to increase core strength and stability. Reducing their risk of back injury in accordance with "the intense physical demands" of the job will require the implementation of core strengthening exercise program* (Fire Engineering, 1998). As a part of their risk management model, fire departments have implemented measures including exercise and weight training facilities at each fire station to reduce the risk of injury due to lack of physical fitness among firefighters (Loflin and Kipp, 1997).

Something must still be missing in the current process though considering that the CFD spent a total of $87,156.91 on back injuries through the years of 2002-2003. According to *Workers' Comp Managed Care,* implementation of a preventive program such as *HealthyBack,* could reduce low back injuries and related workers' compensation costs by more than 75% (May, 2001). This could amount to a reduction of over $65,000 in back injury workers' compensation costs.

Taking into consideration all of the statistics and related information shared thus far, it would be very beneficial for the CFD to consider a more holistic preventative approach to ensure safety. A comprehensive program that integrates the physical and psychological needs of the firefighter and addresses the ergonomic and educational issues

* Core strengthening program implementation refers to the integration of the core strengthening exercises into the firefighter's fitness routine.

as well. This program is available and can be designed and implemented by an Occupational Therapist.

Proposed OT Program

The ability of the firefighters to respond effectively during a call is enhanced by their level of physical and mental preparedness. A back injury prevention program is cost effective for the City of Casper and life effective for the firefighter. Injury rates and sick leaved absences can be reduced, therefore, controlling overtime costs associated with filling a vacant position. When implementing a prevention program it is critical to collaborate with an OT. The OT has the knowledge to evaluate and assist in the analysis of the CFD firefighter's occupational performance. In this challenging field an OT can assist firefighters in dealing with the physical and emotional demands of the firefighting occupation.

It is proposed that the CFD hire or contract a skilled occupational therapist to coordinate and oversee the physical and emotional/behavioral health of its firefighters. Specific services an OT can address include, but not limited to; psychosocial issues, self-care activities, ergonomics, (environmental adaptations, equipment adaptations), job analysis, strategies to promote maximum participation, safety, strength, range of motion, coordination, dexterity, interpersonal interaction, physical fitness, depression, substance abuse, vocational guidance, stress management resulting in overall functional restoration (Occupational Therapy Practice Framework, 2002). The factors are critical in preventing and maintaining the activity demands of the CFD firefighters.

The proposed program would address both the physical and psychological aspects of the firefighter. The physical aspects of the proposed protocol would use a client-

centered approach integrated throughout the Core Strengthening Program and the YMCA *HealthyBack* Program. The protocol recognizes that engagement in occupation is internally motivating and is individually defined and requires active participation by the firefighter (Occupational Therapy Practice Framework, 2002). A core strengthening program is also not complete without addressing the emotional/behavioral well-being of the firefighters. The behavioral health of the CFD firefighters is every bit as important as their physical health and few departments have comprehensive behavioral health programs.

The psychological aspects would also be addressed using a client-centered approach which is addressed by the framework, Occupational Adaptation (OA). OA as described by Schkade and McClung (2001) is a process that allows each person to master and respond adaptively to the various occupational challenges that are encountered in the course of a lifetime. Back injuries can be destructive and damaging to a firefighter's life. Back injuries often mean a permanent loss of some function, causing the firefighter to have to give up certain activities in life they may not be willing to give up. This includes their career, leisure skills, family and even a sex life. Many may not even realize that "although stress is not a direct cause of back injury, stress can provoke tension and cause muscles to tighten up. Therefore resulting in back pain, stiffness, and even muscle spasms" (Pearson, Hayford, Royer, 1995, p.162). This is why the behavioral/emotional aspects must be addressed with the physical nature of the job and the firefighter.

In addition, the components of the job need to be analyzed in general and then specially to each firefighter through a job analysis and ergonomic assessment, modification and education. The combination of all of these can be done competently

and efficiently by an occupational therapist that is trained to view and treat the firefighter and the job holistically.

Conclusion

Imagine a situation in which an individual is absent more often, involved in more accidents or injuries, abuse sick leave benefits, and inadequately executing required responsibilities. Many large corporations such as AT&T, Union Pacific Railroad and DuPont Chemical Company have returns of $1.50 to $3.40 for every dollar invested in their wellness efforts (National Institute of Consulting Services, 1996). A study addressing the effectiveness of a wellness program for an offshore oil company demonstrated a threefold reduction in back injuries, as well as reductions in lost workday injuries (Maniscalco, 1999).

The fire department is an appropriate setting for the OT. The OT would design and implement a comprehensive, integrated program that focuses on injury prevention and wellness by identifying and eliminating risk factors related to back injury and the resulting stress so the direct and indirect costs are minimized. The OT plays an important role in the work place. The OT can design and evaluate programs such as training and education in occupational safety. An OT can analyze the workplace to identify potential ergonomic risks that may contribute to an injury. With an OT on staff, he or she can address how the firefighter engages in performance skills, performance patterns, different contexts, various activity demands, and consider client factors as well as their performance in areas of occupation.

CHAPTER III

ACTIVITIES/METHODOLOGY

The development of the core strengthening program was constructed in a meeting with Dr. LaVonne Fox of UND OT faculty. We devised an initial proposal of a comprehensive core strengthening and injury prevention program for firefighters. The author also interview CFD shift commander, Robert Siplon her father-in-law, who crushed his vertebrae C5 through T1 in a car accident; they discussed exercises that are appropriate for individuals who suffer from back injuries. Commander Siplon stated therapeutic exercises were critical in his full recovery to return to full function at the CFD. The author also discussed back pain injuries with CFD Captain, Cameron Siplon who experiences low back pain occasionally with certain movements. An interview was established with CFD Chief Mark Young, who discussed man hours lost due to back injuries and the financial implications to the City of Casper.

The process of the interview and discussions were to determine the need for a core strengthening program. Through the interviews it was reveled that various back injuries occur at the CFD and a total of $87,156.91 was spent on back injuries during the period of 2002 through 2003.

A core strengthening program was researched for implementation at the CFD stations. The research included utilizing the results of the needs assessment (Appendix D) which was conducted in the Spring of 2004. This needs assessment indicated most

CFD firemen lack sufficient back and abdominal training exercises necessary to prevent back injury. Based upon the research and needs assessment, a comprehensive core strengthening program was chosen for implementation for the CFD*.

It was concluded that a core strengthening program would benefit the CFD and upon completion of gathering the necessary information and data, the core strengthening program was constructed. The protocol concentrates on strengthening the back muscles in conjunction with abdominal muscles to decrease the rate of back injuries. The protocol also focuses on the following areas: abdominal strength, balance, posture, and improve back pain and fatigue indicated in physically demanding occupations like firefighting.

The process of the core strengthening program was designed to take into account the varied education level, fitness level and the understanding of basic terminology by the CFD firefighters. Appendices were made to include the firefighter's schedules, needs assessment results and the needs assessment interpretation.

The scholarly project has consisted of collaboration and continuous feedback from Dr. LaVonne Fox, until the final copy was accepted. A second copy was fabricated to be presented to the CFD.

* Core strengthening program implementation refers to the integration of the core strengthening exercises into the firefighter's fitness routine.

CHAPTER IV

Back Injury Prevention Protocol For Firefighters

Back pain is one of the most continuing medical problems in our society (Muir, T.W., 1994, p. 66). According to the Bureau of Labor Statistics, "more than one million workers suffer back injuries each year, and back injuries account for one of every five workplace injuries or illnesses" (Occupational Safety and Health Administration (OSHA), 1993, p.1). A staggering "80 to 90 percent of all Americans will suffer lower back pain at some point in their life" (Muir, T.W., 1994, p. 66).

The Core Strengthening Program and the YMCA *HealthyBack* Program is a guide to aid in the prevention of back injuries and provide the necessary information to maintain or achieve a healthy back. The protocol includes two sections, the Core Strengthening Program and the YMCA *HealthyBack* Program. Each section includes:

a) Title of the section

b) Brief description of the section

c) Exercise descriptions

d) Basic terminology.

Back Injury Prevention Protocol For Firefighters

Christy Siplon, MOTS

Scholarly Project

University of North Dakota/CC OT Program

2004-2005

Table of Contents

Back Injury Protocol for Firefighters

Introduction

The Core Strengthening Program and the YMCA *HealthyBack* Program is a guide to aid in the prevention of back injuries and provide the necessary information to maintain or achieve a healthy back. These programs consist of core strengthening exercises to be integrated into the CFD fitness routine. Core strengthening has been proven to increase back and abdominal strength, balance, posture, and improve back pain and fatigue in physically demanding occupations like firefighting. The implementation and performance by the CFD firefighters of either of these two programs will achieve the desired core strengthening results.

The protocol includes two sections, the Core Strengthening Program and the YMCA *HealthyBack* Program. Each section includes: a) the title of the section, b) a brief description of the section, c) exercise descriptions and basic terminology. When performing the exercises in either program, the exercises should be performed on a surface such as a rubberized floor or an exercise mat. The YMCA *HealthyBack* is copyrighted material and anyone interested in implementing this program may purchase the *HealthyBack* Book at amazon.com or at your local bookstore (ISBN #0-87322-629-1).

Description

According to *The Doctor's Medical Library*, "backache is the most common presenting complaint in medicine" (Kennedy, 2003). The National Institute for

Occupational Safety and Health (NIOSH) reports that "back injuries account for nearly 20% of all injuries and illnesses in the workplace." The National Strength and Conditioning Association states, "the cost of lost productivity compensation and insurance payments has been estimated at nearly $100 billion annually" (2001, p. 1). Eighty percent of all Americans "will miss at least one week of work in their lifetimes" due to low back pain (Holmes, 1998).

Prevention of back injuries has become the focus of occupational regulations indicating education in ergonomics and physical fitness. Implementation of one of the two included programs will address the need of firefighters to increase their core strength, which will in turn help prevent back injuries. Both programs have general information and medical terminology for those firefighters who do not have additional training and experience with back injuries. The programs are designed to decrease the frequency of back injuries sustained by CFD firefighters on the job. This reduction will reduce the number of man hours lost and the Workmen's Compensation cost to the City of Casper.

Purpose

In the fire service, having a strong "core" is going to be one of the most essential assets to help prevent back injuries. The back injury is usually the result of gradual degeneration to the spine allowing an injury to occur (Industrial Back School, 2004; Jenkins, 2003). Dr. Kennedy (2003) indicates the problem in most back pain is poor tone in the muscles of the back. He goes on to say that the lack of back muscle tone comes from lack of the right kind of exercise.

The purpose of The Core Strengthening Program and The YMCA *HealthyBack* Program are to increase core strength and prevent back injuries. Core strength is derived

from the muscles of your torso; it is the area between your lower ribs and thighs. All movement comes from the core and it is important that your core be strong to help stabilize and control the spine in order to help prevent back injuries. Back injuries that can occur to firefighters due to the lack of exercise and muscle tone; include but are not limited to a ruptured disc, pinched nerve, ligament sprain, muscle strain, and muscle spasm. The following paragraphs are basic descriptions of the most common back injuries that can occur to firefighters.

"A ruptured disc is best known as the most serious of back injuries" (Industrial Back School, 2004, p. 69; Kolber & Zepeda, 2004). The ruptured disc usually happens unpredictably. It is a situation in which the nucleus (the jelly like substance within the center) of the disc has forced its way completely through the annulus (fibrous bands surrounding the nucleus). If the ruptured disc presses on nerves, blood vessels, or ligaments the client may experience severe pain and disability (Industrial Back School, 2004; Kolber & Zepeda, 2004).

A pinched nerve is caused by a bulging or ruptured disc which often compresses a nearby nerve. The pinched nerve can cause pain, numbness or paralysis down the leg. A severe case of a pinched nerve often needs surgery (Industrial Back School, 2004; Martini, Ober, Garrison, Welch and Hutchings, 2001).

The ligaments that hold the spine together also limit the movement in the spine. If movement is forced beyond what the ligaments can control, the ligaments may be damaged and produce a ligament sprain (Industrial Back School, 2004; Kolber & Zepeda, 2004). Although, every day some damage is done; the damage heals with scar tissue,

leaving the ligaments less flexible than they were previously (Industrial Back School, 2004; Kolber & Zepeda, 2004).

A muscle spasm is different than a muscle sprain. A muscle spasm is where the muscles contract forcefully from a response to a disc injury, ligament sprain, or another medical condition such as kidney stones or gynecological problems (Industrial Back School, 2004).

Organization

Having a strong core is critical in reducing and controlling the preventable back injuries to firefighting personnel. Two programs are recommended for the strengthening of core muscles and the prevention of back injuries; Core Strengthening and YMCA Healthy Back.

The Core Strengthening Program is a three phase program that concentrates on strengthening the abdominals muscles, the inner muscles of the pelvic floor and increasing flexibility in conjunction with strengthening the lower back muscles to decrease the rate of back injuries. The Core Strengthening Program is the first program that will be presented in this protocol. The YMCA *HealthyBack* Program is designed as a preventive course and includes a total of 20 exercises in the main program. The *HealthyBack* Program is presented in three levels of progression, from simple to more challenging and it is "a clinically proven exercise program that isolates and strengthens the low back muscles." (Workers' Comp Managed Care, 2001). The YMCA *HealthyBack* Program also includes, as another option, a section for more deconditioned participants. These exercises are easier to perform than the others in the main program.

Core Strengthening Program

Purpose

The Core Strengthening Program is designed to improve core strength, balance, posture and flexibility of specific muscle groups related to the back. These exercises are shown in the next section and consist of base group of abdominal strengthening/stabilization exercises and three phases of exercises, from easy to more challenging. Starting with Phase I and progressing to Phase III; each individual should perform each exercise at their appropriate pace and progress to the next level when appropriate.

Prior to Beginning

The first step of the training program consists of the participant performing the abdominal strengthening/stabilization exercises. These exercises will be included as the base for all phases of the program. Once the participant can successfully complete the abdominal strengthening/stabilization exercises they may proceed to

Program Phases

Participants should progress at their own pace and only after they are able to perform the recommended number of repetitions of the abdominal strengthening/stabilization and Phase I exercises. When the individual can complete the recommended number of repetitions of the Phase II exercises, begin to introduce Phase III exercises. During all three phases the abdominal strengthening/stabilization exercises should be performed in conjunction with the other phases of the program.

Program Progression

Some individuals may advance exercise only to Phase I; this is fine. For those ready to progress, encourage them to add higher levels of intensity and exercise

gradually, emphasizing good posture and technique. Participants should progress at their own pace; exercises should be performed at least once per week. Successful completion of each phase can be determined when the participant can perform each respective phase five days a week. Each exercise should be performed slowly and with control. All participants should be instructed to concentrate on the contracting muscles. They should also be instructed to exhale when the muscle is shortening and inhale when the muscle is lengthening; they should never hold their breath.

Tracking Success

Ask participants to keep a weekly exercise log, keeping track of weekly exercises will allow the occupational therapist (OT) and the participant to monitor their progress or digress.

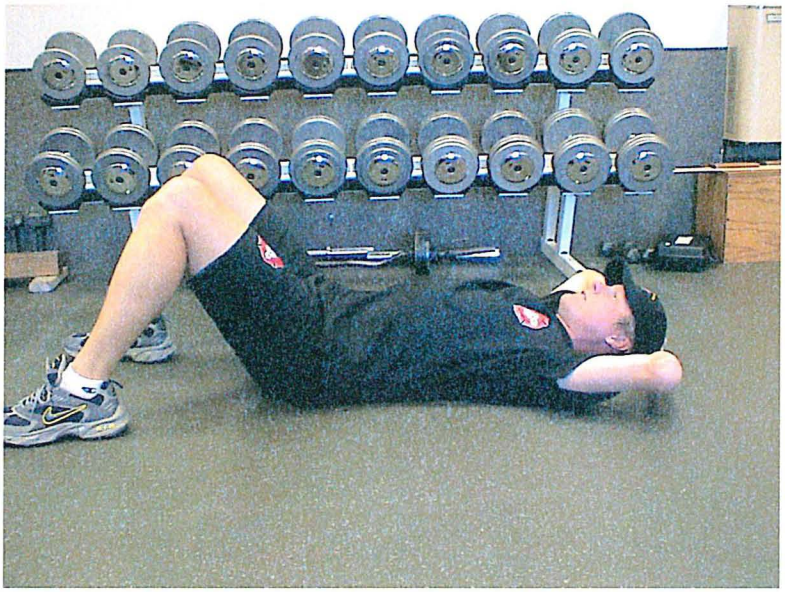
Abdominal Strengthening/Stabilization Exercises

Full Sit-Up (2x25)
Full Crunch (2x40)
"Rocky" Sit-Ups (2x30)
Cowboy Leg Raises (2x25)
"V"- Up (2x20)
Side Crunch (2X30)
"Thinker" (1-2 min)
Side Props (1 min/side)
Bicycle (1 min)
Leg Raises (2x20)
Windshield Wipers (2x20)

****STRETCH HAMSTRINGS****

Full Sit-Up

Step 1:

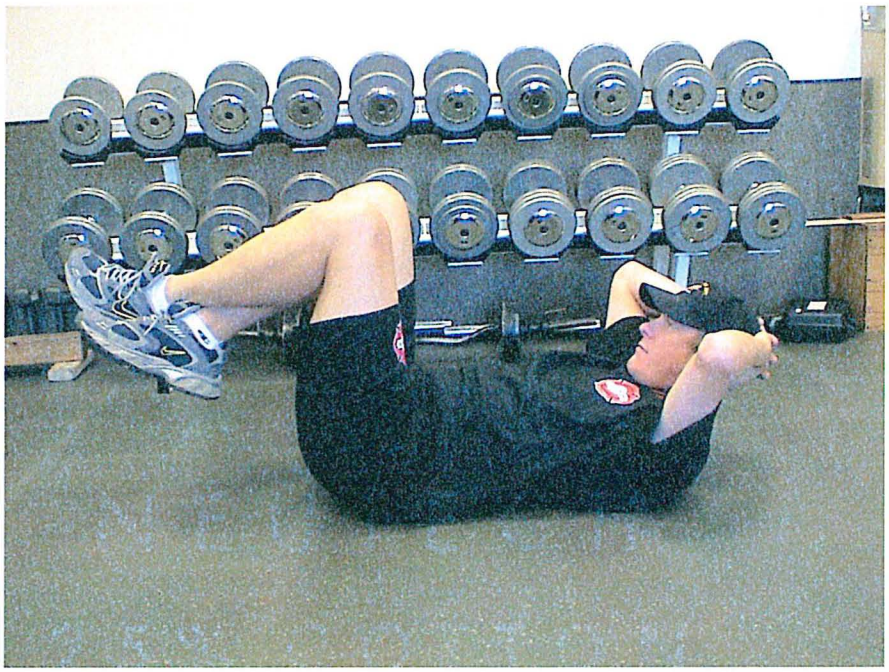


Step 2:

Notes: Keep shoulders and upper back off the floor. Slow and controlled. Stop if you feel discomfort in your lower back. 2 sets x 25 repetitions.

Full Crunch

Step 1:



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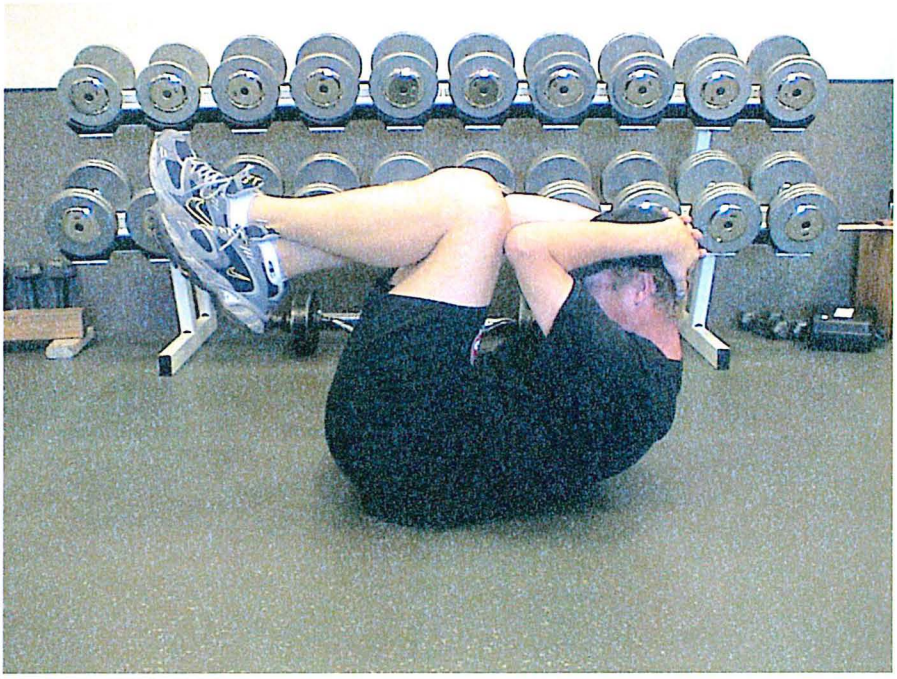
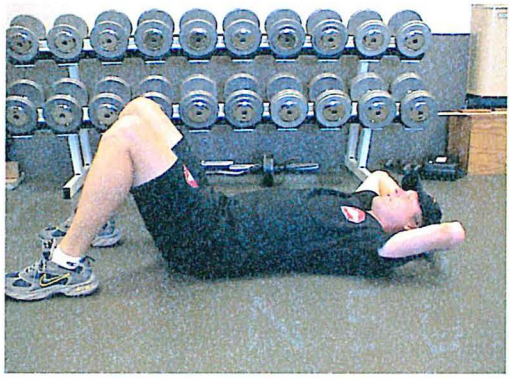


Notes: Contract abdominal muscles while pressing lower back into the floor (causing your upper body to lift up). Move torso, NOT legs. 2 sets x 40 repetitions.

"Rocky" Sit-Ups

Step 1:



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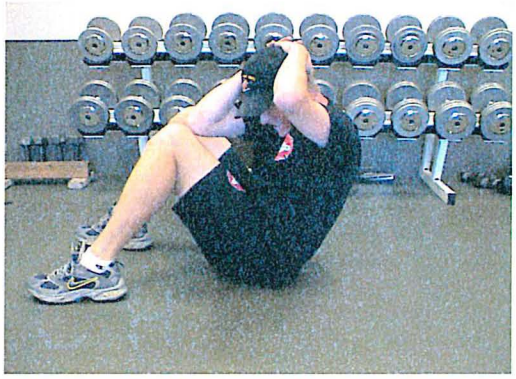

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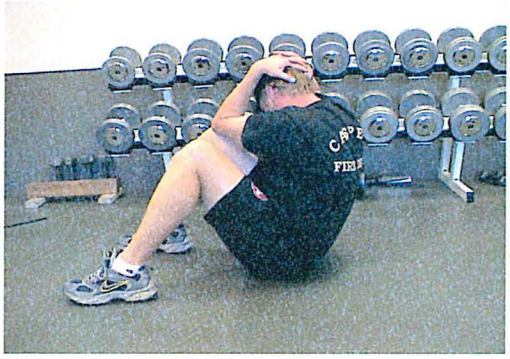

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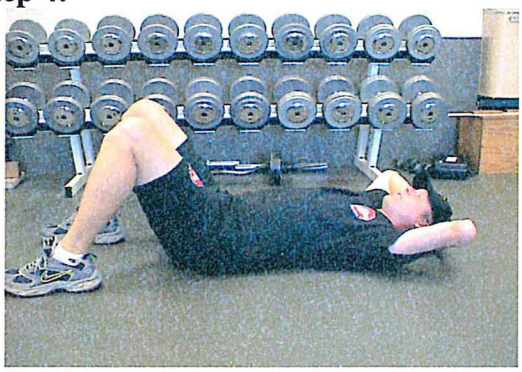

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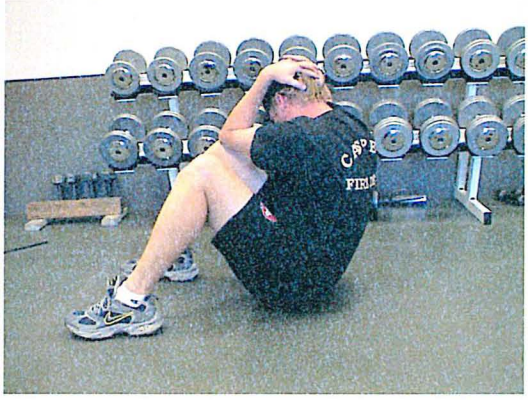

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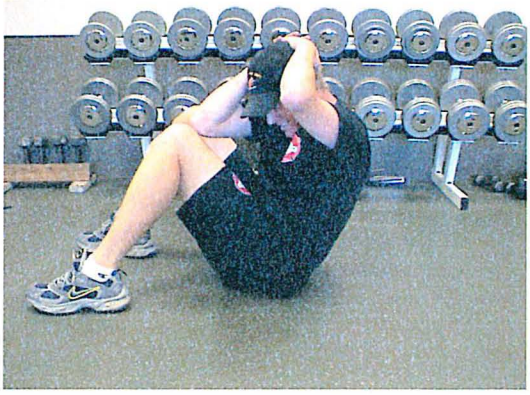
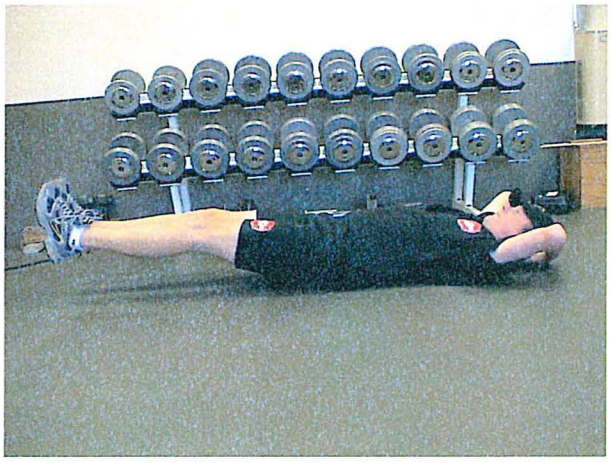


Notes: Alternate knee touched first with corresponding elbow with each sit up. 2 sets x 30 repetitions.

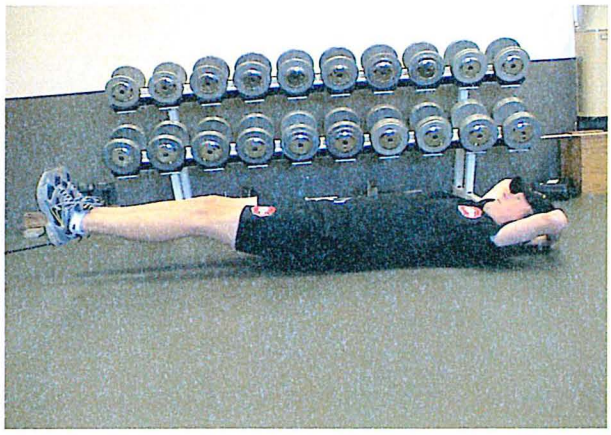
Cowboy Leg Raises

Step 1:



Step 2:

Step 3:

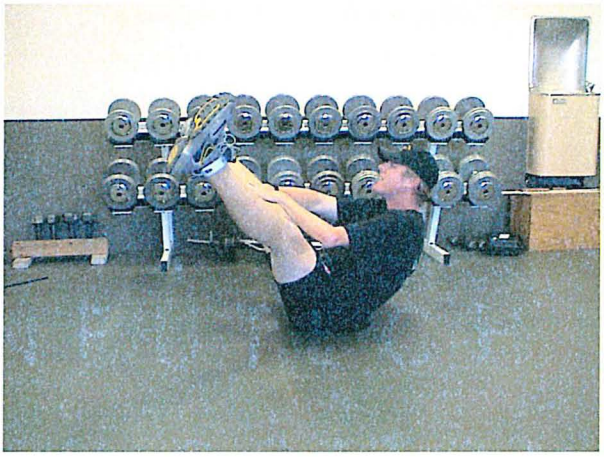


Notes: Keep legs elevated approximately 6-10 inches from the ground throughout set.
2 sets x 25 repetitions.

"V"-Up

Step 1:

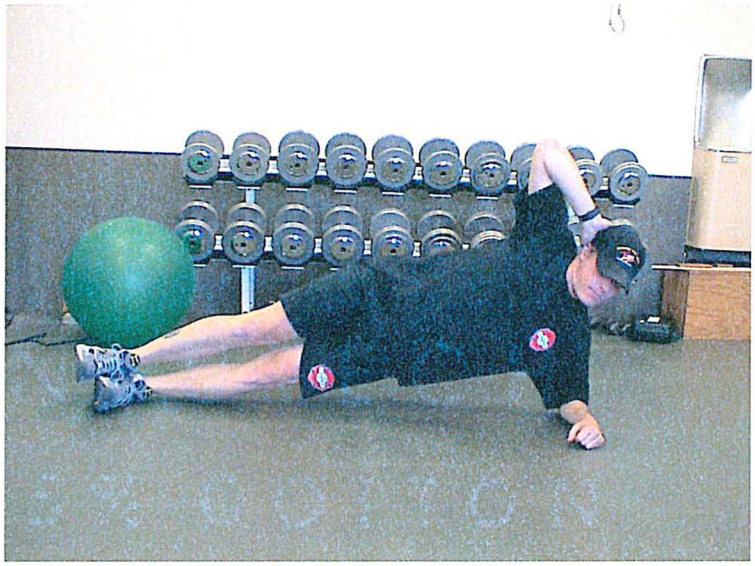
Step 2:



Notes: Keep legs as straight as possible. Raise legs and trunk simultaneously to create a "v" position. Keep head inline with trunk. 2 sets x 20 repetitions.

Side Crunch

Step 1:

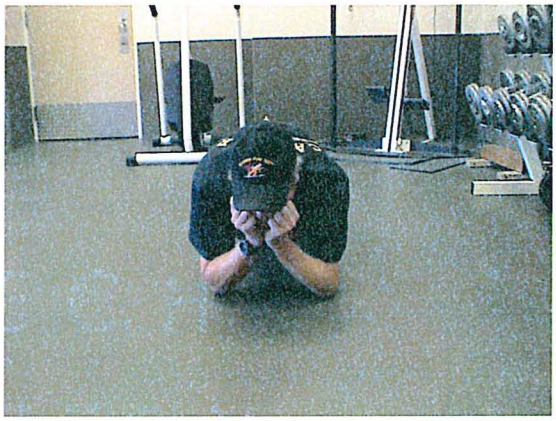


Step 2:

Notes: Do not use shoulder to lift trunk off of the ground. Contract the oblique abdominal muscles to bring shoulder toward hip. 2 sets x 30 repetitions.

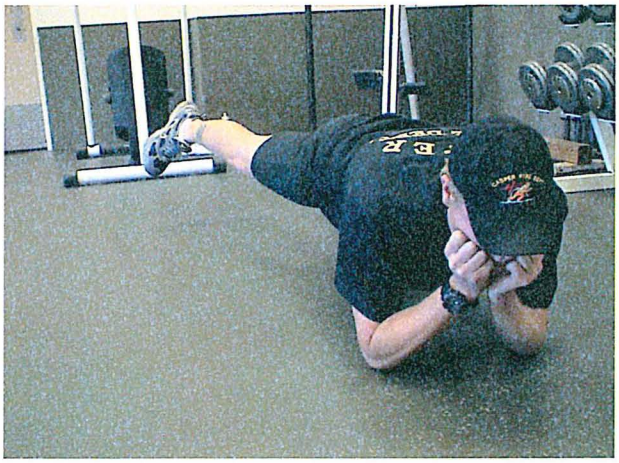
"Thinker"

Step 1:



Notes: Keep back straight through abdominal contraction. Balance on elbows and toes. Remember to breathe. Hold 1-2 minutes.

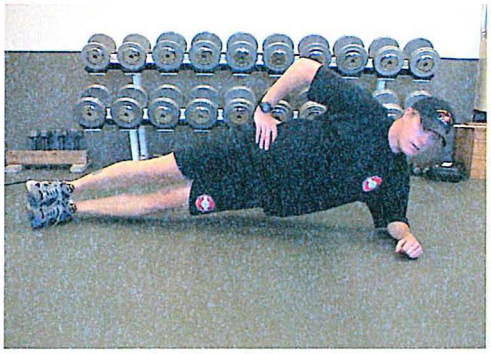
Thinker with Kick-Outs:



Notes: Kick horizontally out (alternating sides) while balancing on elbows and opposite toes. Slow and controlled. Hold 2 minutes.

Side Props

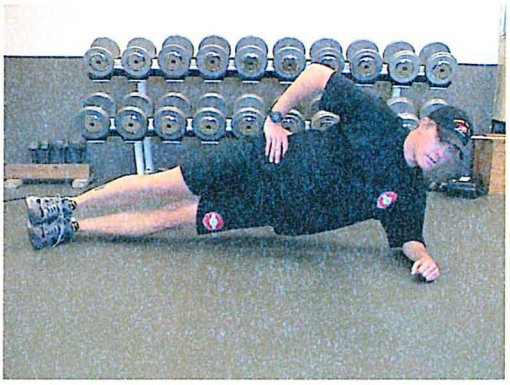
Step 1:



Notes: Balance on elbow/forearm and side of foot. Keep rest of body elevated off of the ground (no other points of contact). Contract abdominal muscles to keep trunk straight. 1 minute each side.

Side Props with Kick-Outs:

Step 1:



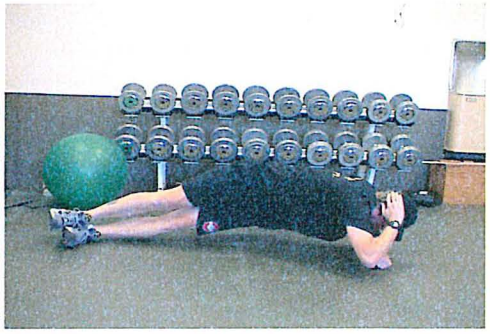
Step 2:

Notes: Kick forward for variation of side props. Slow and controlled.

Side Props with Crunches:

Step 1:

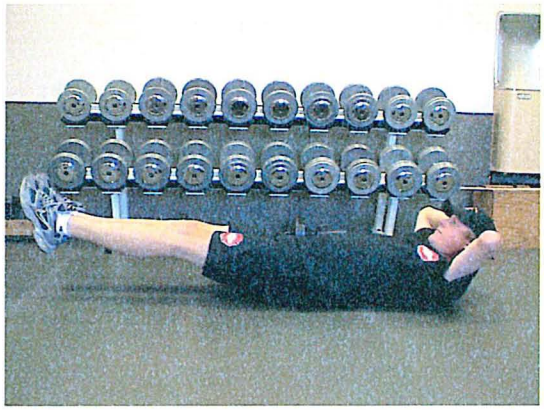
Step 2:



Notes: Another variation of side props. Rotate trunk to touch elbow to ground.

Bicycle

Step 1:



Step 2:

Step 3:

Notes: Crunch variation. Alternate touching elbow to opposite knee. Continue for 1 minute set.

Leg Raises

Step 1:

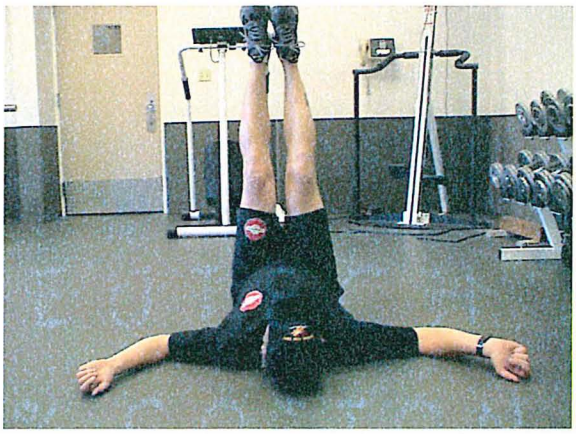
Step 2:

Step 3:

Notes: Keep legs elevated throughout set. Slow and controlled. Keep head inline with trunk. 2 sets x 20 repetitions.

Windshield Wipers

Step 1:



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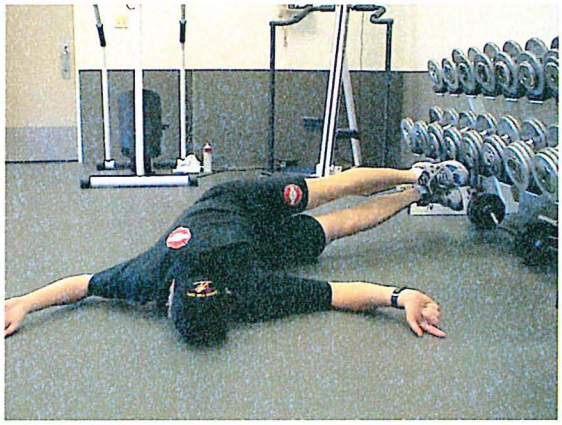

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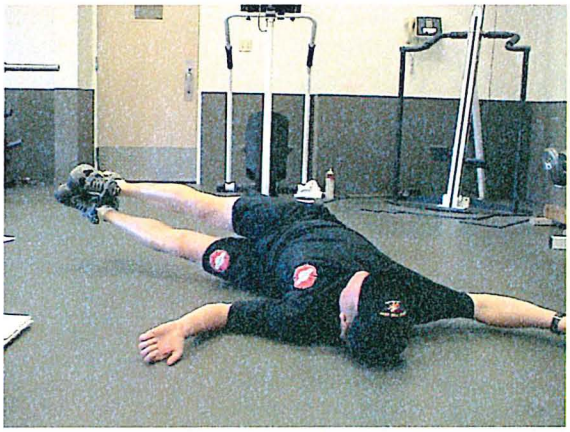
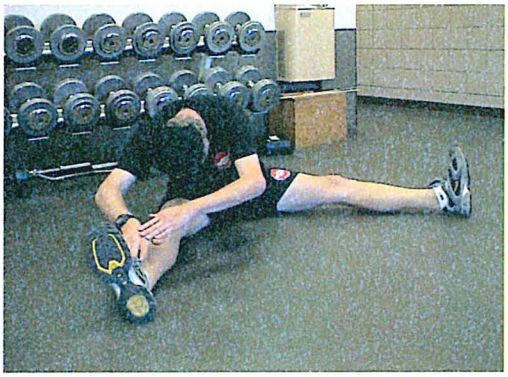
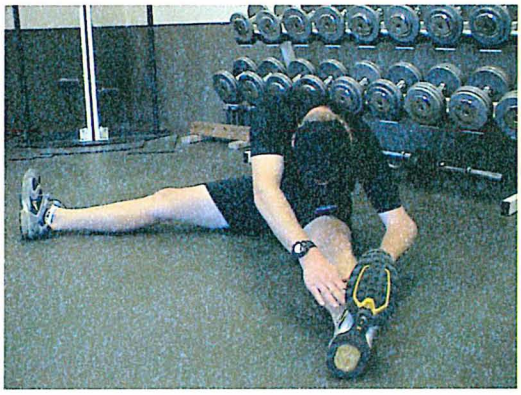


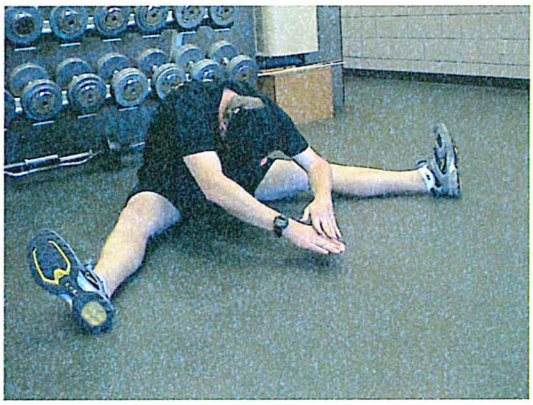
Notes: Keep both shoulders on the ground at all times. Hold legs perpendicular to the ground. 2 sets x 20 repetitions.

Hamstring Stretches

Example:







Notes: Because of muscle origins and insertions, trunk health is dependent upon hamstring stretch.

Core Strengthening/Stabilization Exercises

Phase I

2-Leg Bridge
1-Leg Bridge (Both Legs)
Prone Roll Ups
Groin Stretch (3x30 seconds)
Supine Tomahawk
Pelvic Tilts

Phase II

Phase I (3x10)
Superman
Bent 2-Leg Bridge
Supine Kick Outs

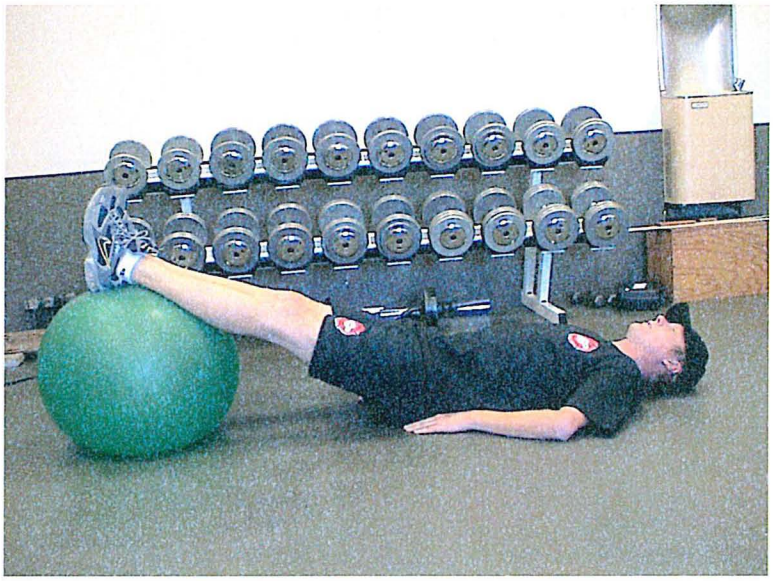
Phase III

Phase I (1x10)
Phase II (2x10)
Supine Ball Lifts
Prone Walk-Out to Push Up
Supine Walk-Out to Bridge

******SETS ARE 3X10 UNLESS NOTED******
******HOLD CONTRACTIONS FOR 2-COUNTS******
******GO SLOW******
******GOOD POSTURE******

2-Leg Bridge

Step 1:



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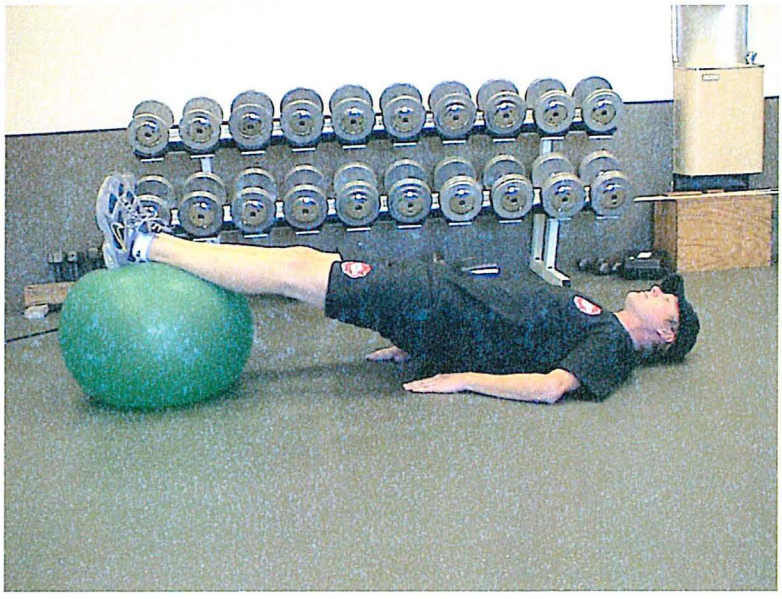
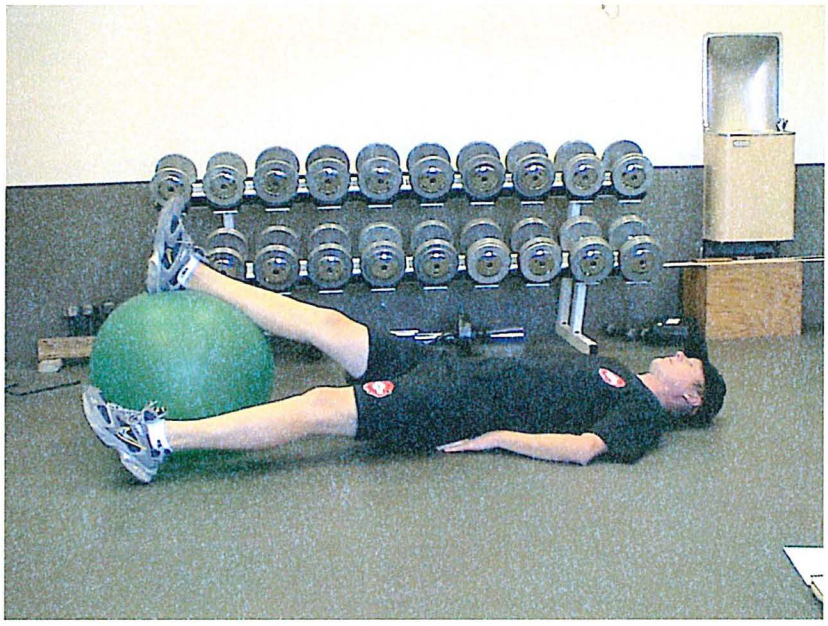


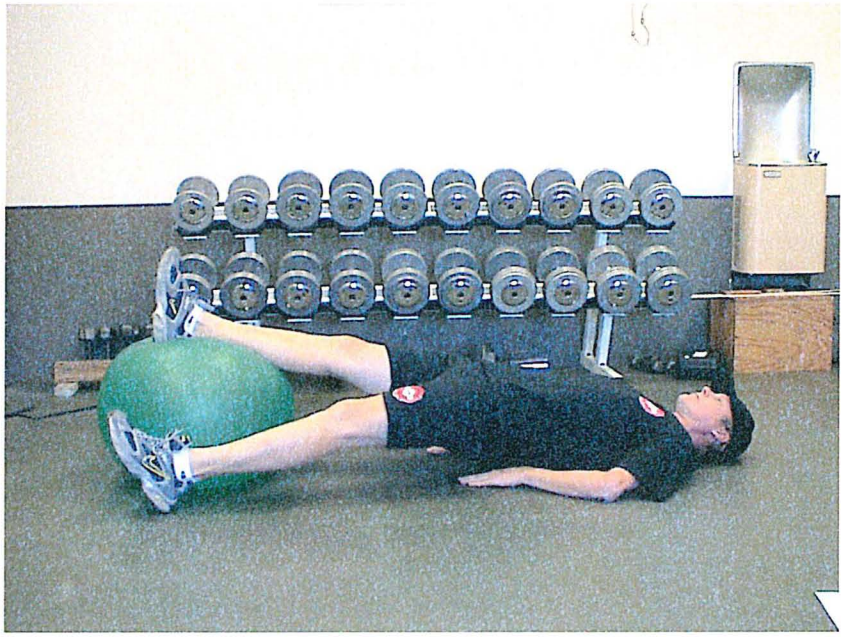
Notes: Elevate hips off ground. Hold for 2 count. Repeat.

1-Leg Bridge (Both Legs)

Step 1:



Step 2:

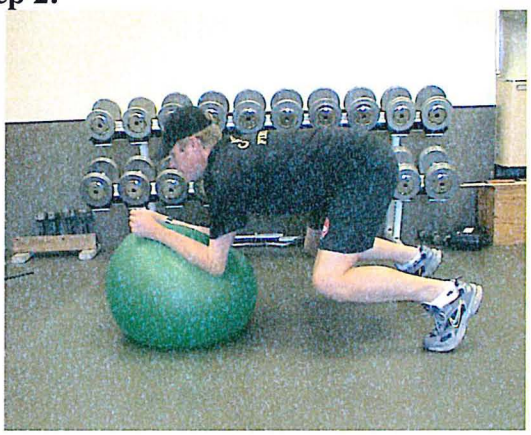


Notes: Elevate hips off ground using only leg up on therapy ball. Hold for 2 count. Repeat.

Prone Roll Ups

Step 1:

Step 2:



Step 3:

Step 4:

Step 5:

Step 6:

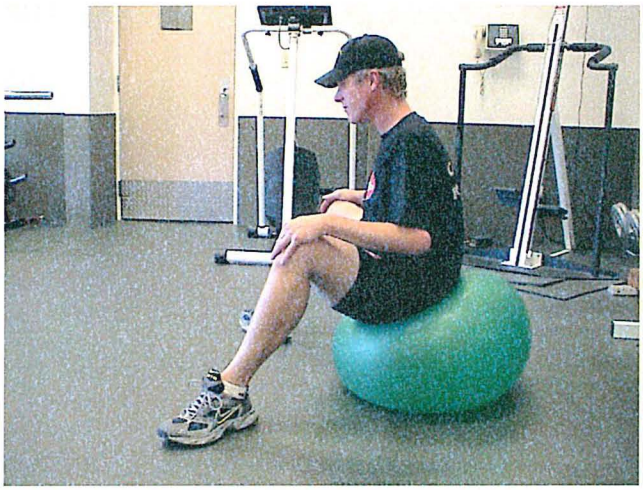
Notes: Begin behind therapy ball. Roll out onto elbows and toes. Roll back to starting position. 3 sets x 10 repetitions

Groin Stretch

Step 1:

Step 2:

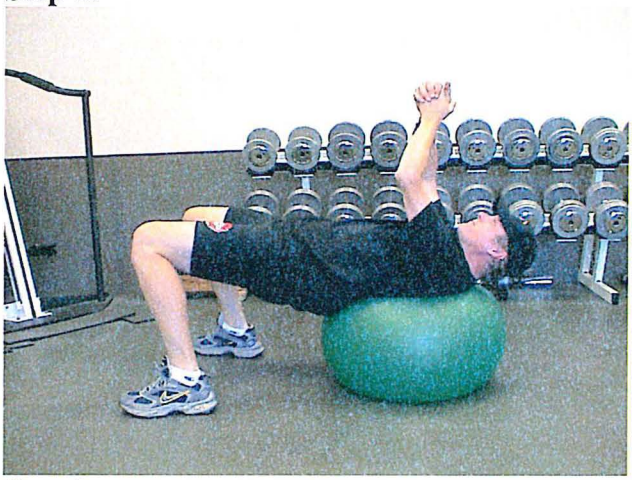
Step 3:

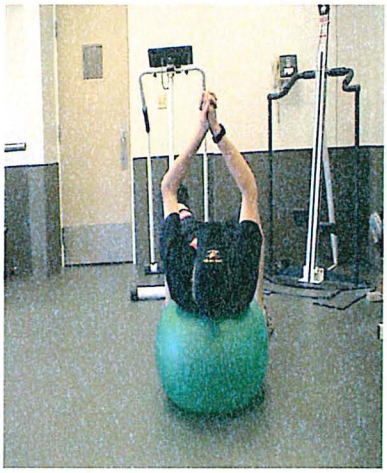


Notes: Seated on edge of ball. Roll forward on each leg separately, then together for groin stretch. Feet pointed outward. 3 sets x 30 seconds

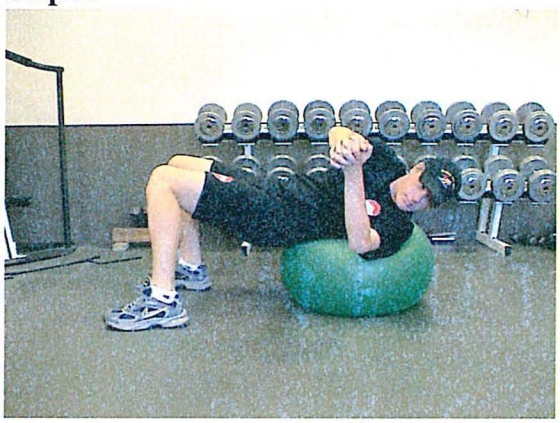
Supine Tomahawk

Step 1:





Step 2:



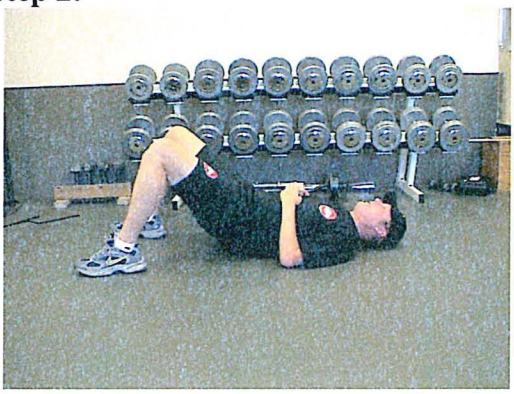
Step 3:

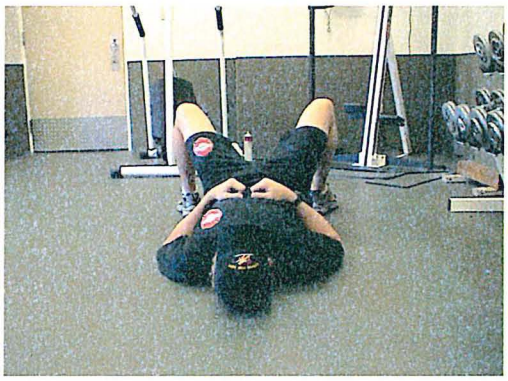
Notes: Arms held in front and together. Rotate trunk side-to-side on therapy ball. Keep abdominal muscles contracted to keep trunk inline. 3 sets x 10 repetitions.

Pelvic Tilts

Step 1:

Step 2:





Notes: Contract lowest abdominal muscles NOT upper abdominals.
3 sets x 10 repetitions

Pelvic Tilts with Towel:

Step 1:

Step 2:

Notes: Towel is used when back problems exist.

In developing healthy back habits, progression is key; after accomplishing Phase I exercises, increase intensity and duration of workouts then progress to Phase II. Phase II exercises are accomplished on the floor and with a Physio-ball.

Introduction

It is possible to achieve a healthy back. Consistency in strengthening and progression will help prevent or minimize back injuries. Progression is key; after accomplishing Phase I exercises, increase intensity and duration of workouts then progress to Phase II. Phase I exercises are accomplished on the floor and in conjunction with a Physio-ball.

Note: If using a Physio-ball, the first few times you may need a partner to help keep your balance.

PHASE I

2-Leg Bridge
1-Leg Bridge (Both Legs)
Prone Roll Ups
Groin Stretch (3x30 seconds)
Supine Tomahawk
Pelvic Tilts

PHASE II

Phase I (3x10)
Superman
Bent 2-Leg Bridge
Supine Kick Outs

Superman

Superman with Therapy Ball

Step 1:

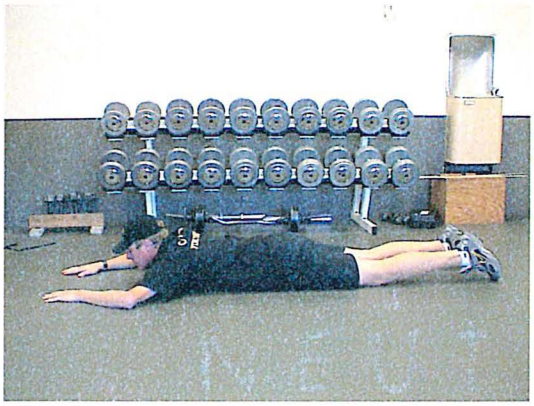
Step 2:

Step 3:

Step 4:

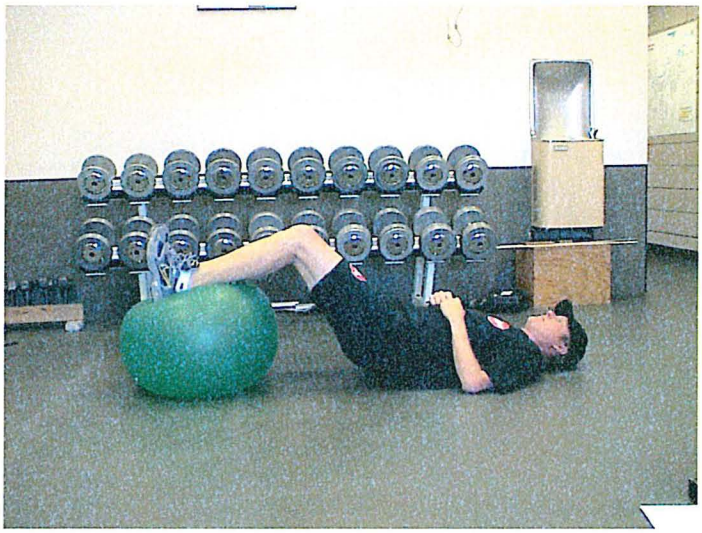
Notes: Contract abdominal muscles to lift legs or trunk off of ground.
3 sets x 10 repetitions

Superman without Therapy Ball

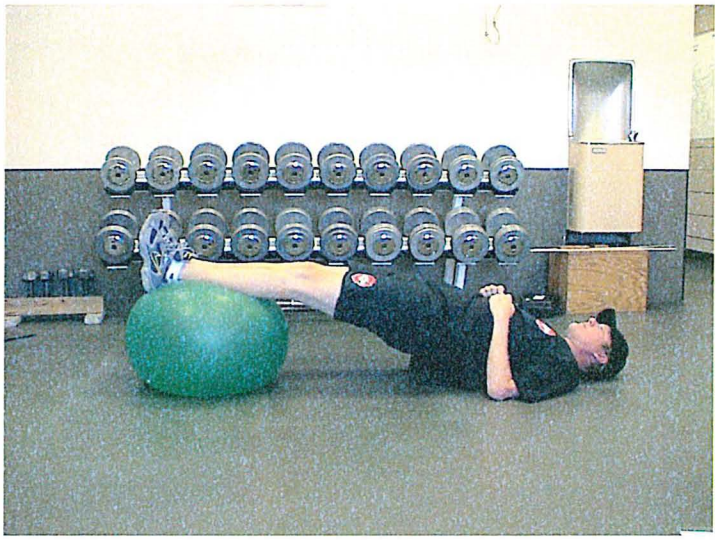


Bent 2-Leg Bridge

Step 1:



Step 2:



Notes: Roll legs out on therapy ball. Keep hips elevated (abdominal contraction). 3 sets x 10 repetitions.

Supine Kick-Outs

Step 1:

Step 2:

Step 3:

Notes: Keep trunk inline while alternating leg extensions.
3 sets x 10 repetitions.

Incorrect Form

Phase III exercise will aid in prevention of further/future back injuries. Progression is vital, after accomplishing Phase II exercises increase intensity and duration of workouts then progress to Phase III. Phase III exercises are advanced and accomplished with a Physio-ball.

PHASE III

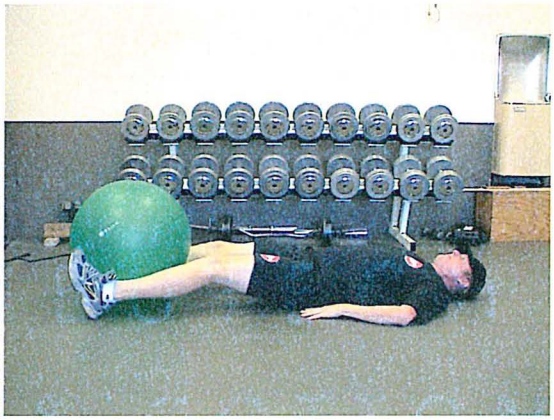
Phase I (1x10)
Phase II (2x10)
Supine Ball Lifts
Prone Walk-Out to Push Up
Supine Walk-Out to Bridge

Supine Ball Lifts

Step 1:

Step 2:

Step 3:



Notes: Keep legs straight. Press lower back into ground. Keep arms at side.
3 sets x 10 repetitions.

Prone Walk-Outs to Push Up

Step 1:

Step 2:

Step 3:

Step 4:

Step 5:

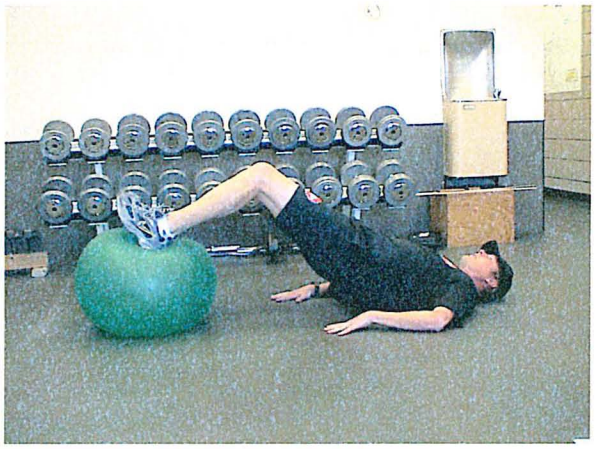
Step 6:

Step 7:

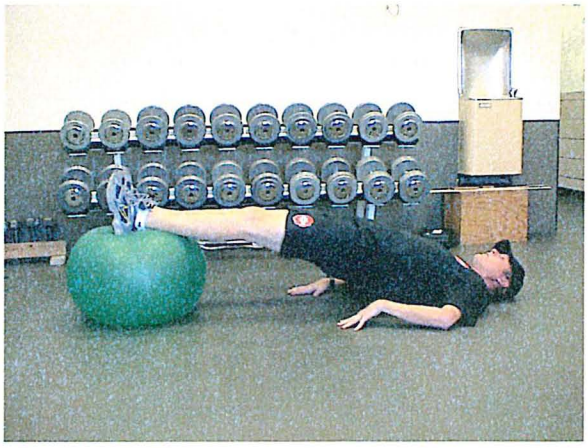
Supine Walk-Outs to Bridge

Step 1:

Step 2:



Step 3:



Notes: Keep hips elevated. Roll out therapy ball with heels.
3 sets x 10 repetitions.

YMCA *HEALTHY BACK* PROGRAM

The Healthy Back Exercises

The new participant book published in 1994, the YMCA Healthy Back Book, introduces a completely redesigned exercise format for the YMCA Healthy Back Program. A total of 20 exercises are included, presented in three levels of progression from easy to more challenging. This provides many options for designing programs using different combinations and repetitions of the exercises. These exercises are appropriate for the majority of participants and should be the foundation of any YMCA Healthy Back Program.

This class can be offered in a number of different formats:

- **Seminar:** In this format participants meet once for 1 1/2 to 2 hours to review the exercises and basic principles. The seminar includes the participant book and/or video for home exercise..
- **Short-term class:** A short-term course can meet for 30 to 45 minutes 2 or 3 times a week for 2 to 4 weeks. Home exercise on all non-class days is essential.
- **Long-term class:** A long-term course can meet for 30 to 45 minutes 1 or 2times a week for 6 to 8 weeks. Home exercise on all non-class days is essential.

In all of these options, encourage participants to exercise at their own pace and level, progressing as their performance and comfort improves.

Healthy Back Program Class Format

Here is a suggested format for the four components of a 30-minute Healthy Back exercise class: warm-up, stretching, the Healthy Back Exercises, and cool-down and relaxation.

Warm-Up (5 Min)

Warm-up prepares the body for exercise by increasing blood flow to the muscles. The warm-up should consist of a rhythmic, full-range-of-motion activity such as slow walking. This will warm the muscles slightly, making the stretching and strengthening exercises to follow easier and more effective.

Stretching (5 minutes)

This part of the class is for mild, preliminary stretching after the body is warmed up and before beginning more vigorous exercise. The stretches are performed slowly and gently while standing or sitting in a chair. Here are some stretches:

Neck Muscles

- Head circles: Slowly circle the head forward from the right shoulder to the left shoulder. Reverse. Repeat a few times. Do not circle the head to the back, as this can place undue stress on the cervical spine.
- Head tilts: Slowly tilt the head so that the right ear moves down toward the right shoulder. Hold, then repeat on the left side.
- Head rotations: Slowly rotate the head by looking over the right shoulder. Hold, then repeat to the left.

Shoulder Muscles

- Shoulder shrugs: Raise both shoulders up toward the ears, hold, then lower down. Repeat.
- Shoulder circles: Circle both shoulders backward 8 to 10 times.
- Arm raises: Holding both hands at shoulder level, slowly reach up with one hand, straightening the arm. Lower, then repeat with the other arm.

Trunk Muscles

- Forward bend: With arms in front and knees bent, bend forward at the waist, slowly and without straining. Head should go no lower than the waist. Slowly rise back up. Repeat two more times.
- Side bend: With arms at sides, slowly bend the trunk to the right side, hold, and raise back. Repeat to left side. Continue alternating sides for 5 repetitions.
- Backward bend (perform standing only). Place palms of hands on lower back and slowly bend backward at the waist, supporting the back with the hands. Do not extend the back more than a few degrees past the upright position or past the point of comfort. Repeat 2 more times.

The Healthy Back Exercises (15 minutes)

This part of the class is designed to improve the strength and flexibility of specific muscle groups related to the back. These exercises are described in the next section and appear in the YMCA Healthy Back Book. There are three levels of exercises, from easy to more challenging. Instruct class participants to perform each exercise at their appropriate level within the group class.

When a program begins, teach the Level 1 exercises to all participants. They should do these six exercises in class and every non-class day at home. After the first week, begin to introduce the Level 2 exercises. Participants should progress to that level at their own pace and only after they are able to perform the recommended number of repetitions of the Level 1 exercises. When they can complete the recommended number of repetitions of the Level 2 exercises, introduce the Level 3 exercises.

Some individuals may exercise only at Level 1 throughout the course; this is fine. For those ready to progress, encourage them to add higher levels of exercise gradually, emphasizing good posture and technique.

Each exercise should be performed slowly and with control. Tell participants to concentrate on the contracting muscles. Instruct them to exhale when the muscle is

shortening and inhale when the muscle is lengthening. They should never hold their breath.

Ask participants to keep a weekly exercise tog so you can monitor their progress. A sample log appears at the end of this chapter.

The following are the muscle groups and their corresponding exercises at each level. The recommended number of repetitions is listed for each exercise.

Postural Muscle Strengthening

Level 1: Pelvic tilt (standing) and pelvic tilt (on your back), 15-20 reps each
Level 2: Wall slide, 5-10 reps of 10-20 sec each
Level 3: Supine bracing, 10-20 reps per leg

Back Stretch

Level l: Back arch, 5-10 reps
Levels 2 and 3: None

Hip Flexor/Extensor Stretch

Level 1: Knees to chest, 5-10 reps per leg
Level 2: Hip flexor stretch, 5-10 reps per leg
Level 3: Hip flexor stretch (advanced), 3-5 reps per leg

Hamstring Stretch

Level 1: Leg raise, 5-10 reps per leg
Level 2: Single leg raise, 5-10 reps per leg
Level 3: Single leg raise (advanced), 5-10 reps per leg

Chest/Abdominal Stretch

Level 1: Prone on elbows, 1 rep for 15-30 seconds
Level 2: Press up, 5-10 reps
Level 3: None

Abdominal Strengthening

Level 1: None
Level 2: Trunk curl, 15-30 reps
Level 3: Diagonal curl, 10-15 reps per side lower: trunk rotation, 5-10 reps

Hip Extensor Strengthening

Level 1: None
Level 2: Quadruped, 5-10 reps per limb
Level 3: Quadruped (advanced), 5-10 reps per pair

Back Extensor strengthening

Level 1: None
Level 2: Prone extension, 10-15 reps per pair
Level 3: upper trunk raises, 5-10 reps

The sequence for the exercises, in the YMCA Healthy Back program, is as follows:

Level 1
Pelvic tilt (standing)
Pelvic tilt (on your back)
Back arch
Knees to chest
Leg raise
Prone on elbows

Level 2
Wall slide
Quadruped
Single leg raise
Hip flexor stretch
Trunk curl
Press up
Prone extension

Level 3
Quadruped (advanced)
Hip flexor stretch (advanced)
Lower trunk rotation
Single leg raise (advanced)
Diagonal curl
Supine bracing
Upper trunk raise

Cool-Down and Relaxation (5 min)
Use various relaxation techniques for a cool-down phase of the class. Have participants lie on their backs on a mat or other comfortable surface with knees bent and feet flat on the floor. Refer to the YMCA Healthy Back Book (pp. 96-101) for suggestions.

Exercise Descriptions

This section provides illustrations and instructions for each exercise at all three levels.

LEVEL 1

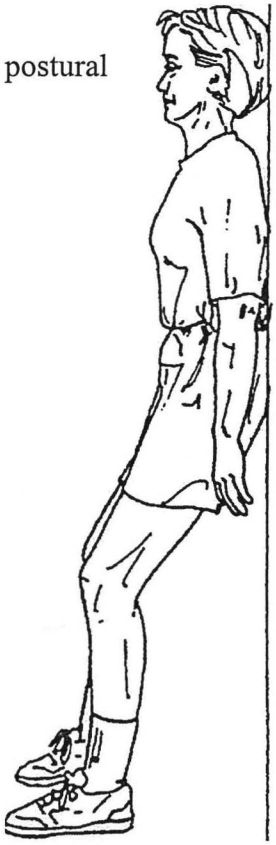
Pelvic Tilt (Standing)

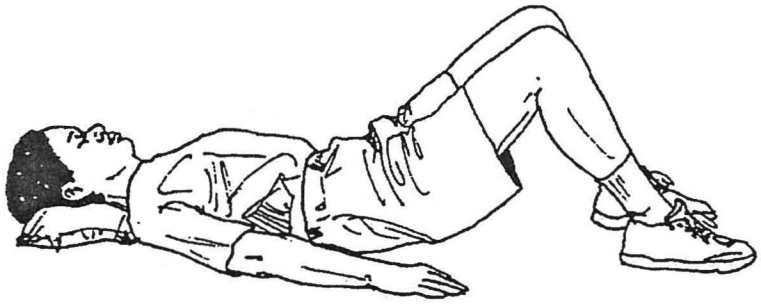
Stand with your back against a wall, feet shoulder-width apart, and heels 12 to 18 inches (about 30 to 46 centimeters) from the wall. Slightly bend your knees.

Rotate your pelvis so your lower back comes in contact with the wall. Tighten your lower abdominal muscles (the muscles from your belly button to the tops of your legs) and hold this "pelvic brace" position for 2 to 5 seconds.

Repeat 15 to 20 times.

Purpose: Strengthen abdominal and stretch lower back muscles postural muscles

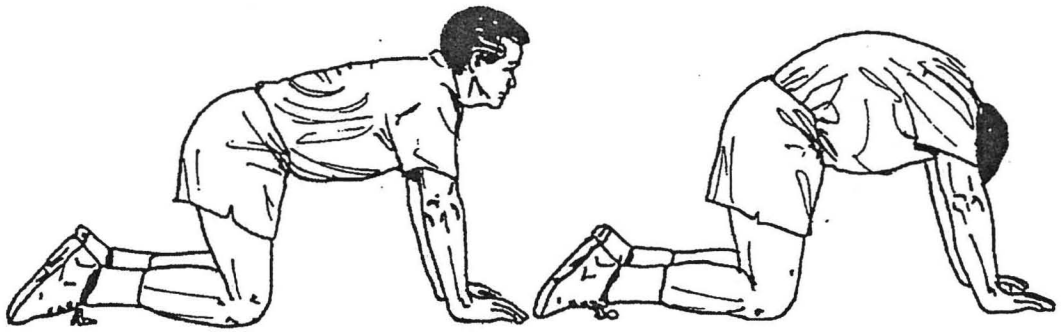




Pelvic Tilt (On Your Back)

Lie on your back with both knees bent, feet flat on the floor, and arms at your sides. (You may wish to place a small pillow under your head or neck.)
Exhale and rotate your pelvis so your lower back comes in contact with the floor. Tighten your lower abdominal muscles and hold this "pelvic brace" position for 2 to 5 seconds.
Repeat 15 to 20 times.

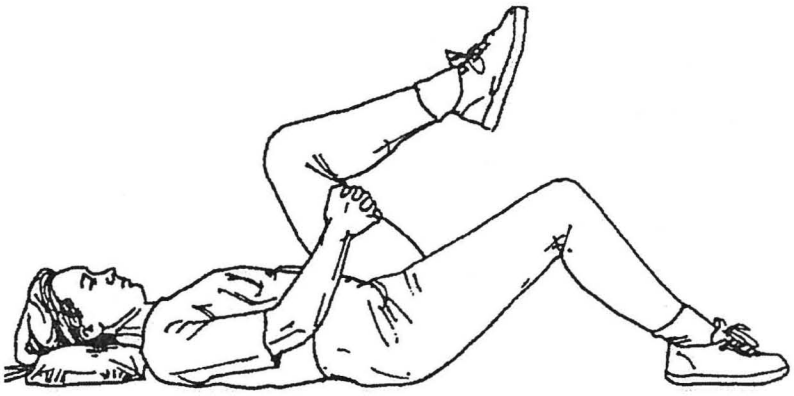
Purpose: Strengthen postural muscles



Back Arch

Get on all fours on the floor and pull in your abdominal muscles.
Drop your head forward and round your back as you tilt your pelvis. Hold for 5 seconds.
(See the pelvic tilt exercises if you have trouble understanding how to tilt your pelvis.)
Repeat 5 to 10 times.

Purpose: Stretch back muscles



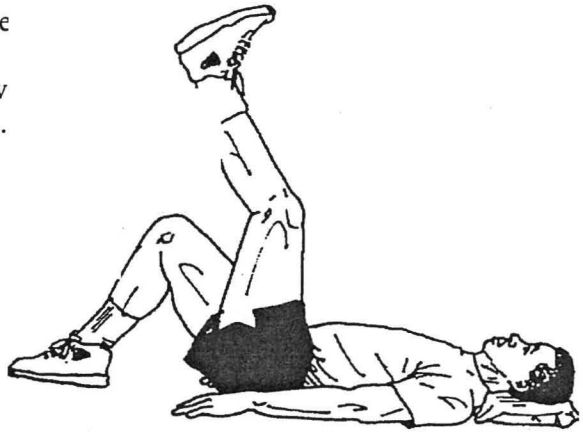
Knees to Chest

Lie on your back with both knees bent, feet flat on the floor, and arms at your sides. (You may wish to place a small pillow under your head or neck.) Do a pelvic tilt and hold. (Your abdominal muscles should be tight.)
Exhale, and pull one knee toward your chest and hold for 5 seconds.
Alternating sides, repeat 5 to 10 times per leg. When it feels comfortable, try pulling first one, then both knees toward your chest at the same time. Hold your pelvic tilt and don't rock.

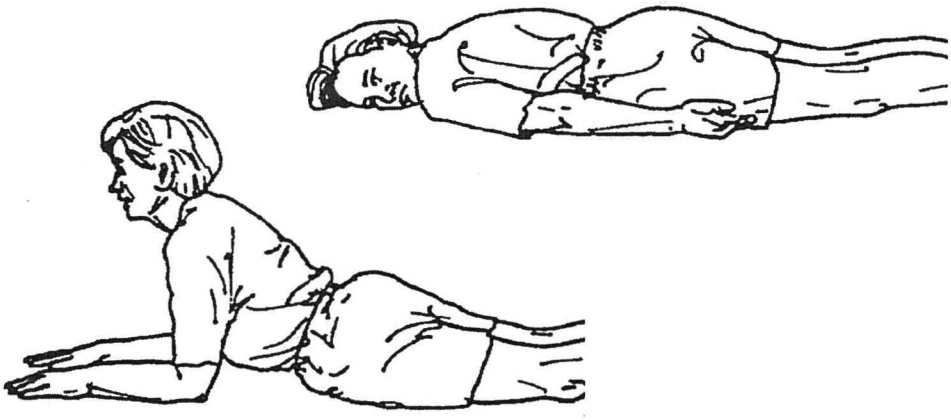
Purpose: Stretch hamstring and hip extenson

Leg Raise

Lie on your back with both knee bent, feet flat on the floor, and arms at your sides. (You may wish to place a small pillow your head or neck.) Do a pelvic tilt and hold. (Your abdominal muscles should be tight.)
Exhale, and straighten one knee and slowly raise your leg as high as possible without pain. (Do not allow your pelvis to rock or to roll upward.) Try to keep your leg Straight without locking your knee. Hold this position for 5 seconds, then slowly return it to the original position with knee bent and foot on the floor.
Repeat 5 to 10 times per leg.



Purpose: Stretch hamstrings



Prone on Elbows

Lie facedown on the floor with your arms at your sides and your head turned to one side. Take deep breaths and try to relax for 3 to 5 minutes.

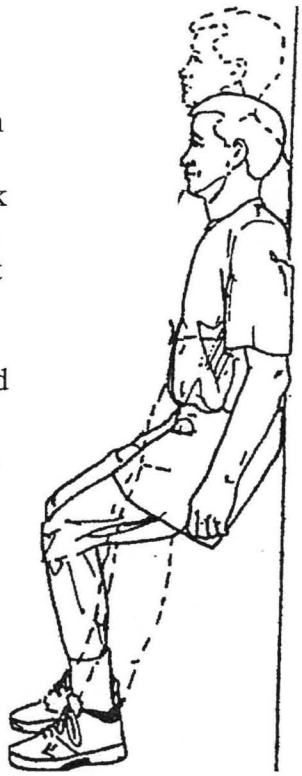
Place your elbows under your shoulders as you ease your trunk up, and then rest your weight on your forearms. (Use your shoulders and arms to push your head and upper trunk up; do not use your back muscles to lift.) Look straight ahead. Hold this position for 15 to 30 seconds. .

Do once per exercise session.

Purpose: Stretch chest and abdominal muscles

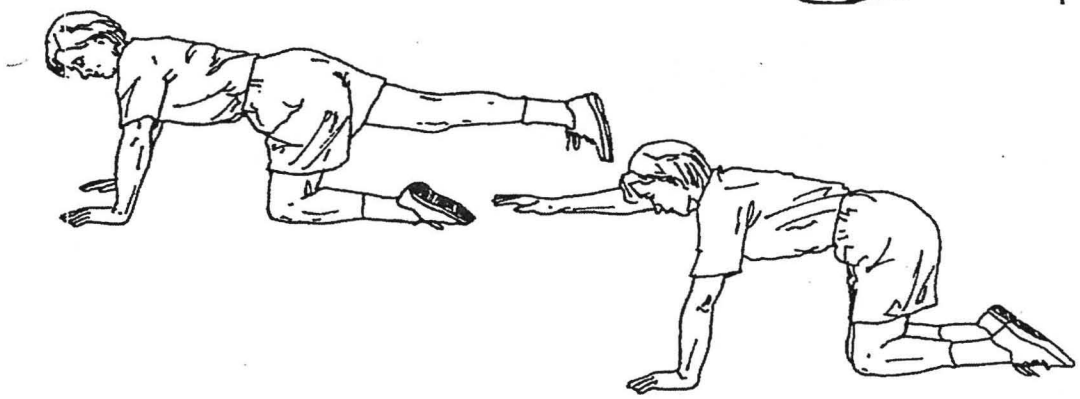
LEVEL 2

Wall Slide



Stand with your back against a wall, feet shoulder-width apart, and heels 12 to 18 inches (about 30 to 46 centimeters) from the wall. Slightly bend your knees. Exhale, and rotate your pelvis so your lower back comes in contact with the wall. Tighten your lower abdominal muscles and hold. Bend your knees while sliding your back down the wall. Initially just bend your knees slightly; when you are comfortable with that, go a bit farther and then a bit farther. Do not ever bend your knees more than 90 degrees. Hold the bottom position for 10 to 20 seconds. Repeat 5 to 10 times. This exercise also strengthens your abdominal and thigh muscles. Try to build up to holding for 2 minutes. If your knees hurt, try bending them only slightly. Reduce the number of repetitions as you increase the length for which you hold each repetition.

Purpose: Strengthen postural and thigh muscles



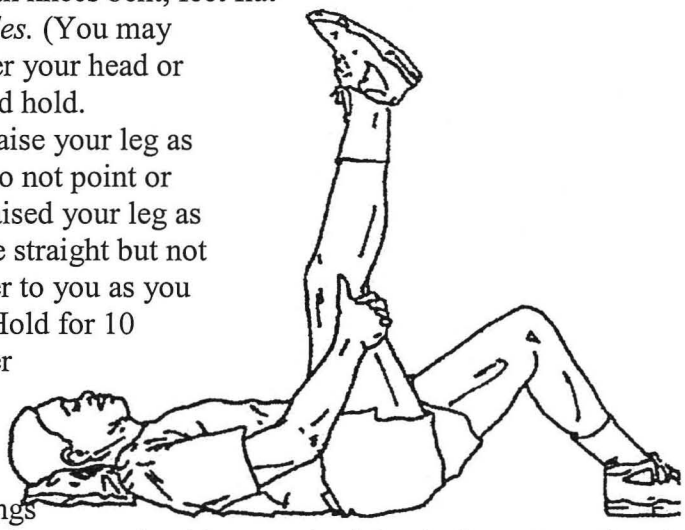
Quadruped

Get on all fours on the floor. Brace your pelvis by pulling in your abdominals and holding your back in a pain-free position.
Slowly raise each arm and each leg, one at a time, to a horizontal position. Hold each up for 5 seconds, then lower it. Do not allow your trunk to sag by maintaining your pelvic brace, and keep your eyes on the floor.
Repeat 5 to 10 times per limb. It is very important that your trunk not sag or tilt during this exercise, so the first few times you try it either watch yourself in a mirror or have a friend watch you.

Purpose: Strengthen back hip extensors

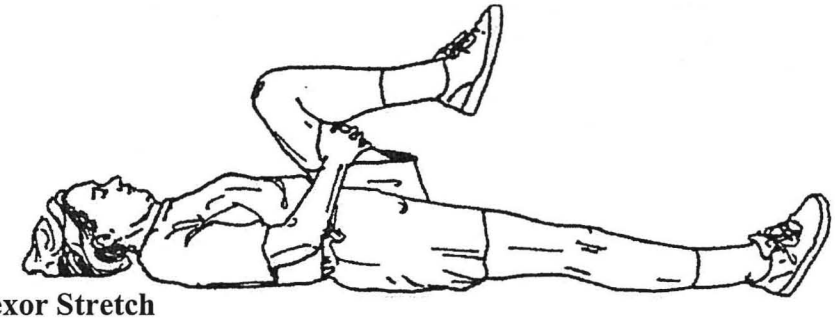
Single Leg Raise

Lie on your back with both knees bent, feet flat on the floor, and arms at your *sides.* (You may wish to place a small pillow under your head or neck.) Exhale, do a pelvic tilt, and hold. Straighten one knee and slowly raise your leg as high as possible without pain. (Do not point or flex your foot.) After you have raised your leg as far as you can, keeping your knee straight but not locked, gently pull your leg closer to you as you contract the front of your thigh. Hold for 10 seconds. Repeat 5 to 10 times per leg. Your goal should be to raise each leg a minimum of 80 degrees off the floor.



Purpose: Stretch hamstrings

Caution: If you have sciatica, consult with your physician before attempting the Single Leg Raise. Don't do it when your sciatica is painful.



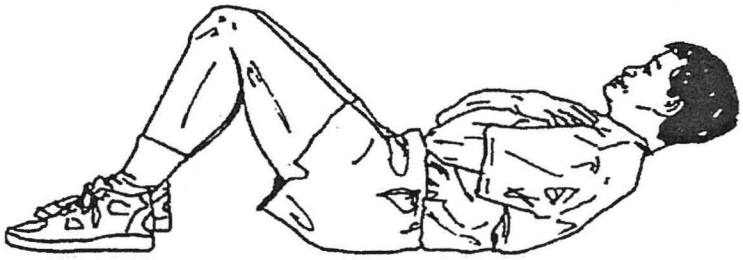
Hip Flexor Stretch

Lie on your back with legs straight and arms at your sides. Grasp one thigh behind your knee and pull it toward your chest until your lower back is in contact with the floor. Keep the opposite leg straight at the same time. If your extended leg does not stay on the floor, hold this position 5 to 10 seconds. If you are doing this exercise correctly and your extended leg *is* in contact with the floor, you don't need to perform this exercise.

Repeat 5 to 10 times per leg if your extended leg does not stay on the floor. If it does, eliminate this exercise from your routine; however, you may want to try this exercise periodically to make sure your hip flexors are still flexible.

Purpose: Stretch hip flexors

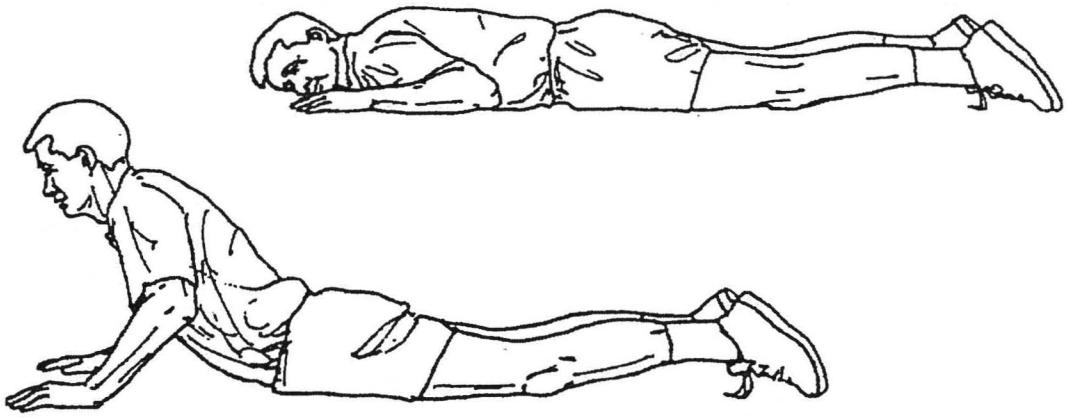
Trunk Curl



Lie on your back with both knees bent and feet flat on the floor. Cross your arms across your chest, do a pelvic tilt, and hold. Keeping your lower back in contact with the floor, exhale and slowly raise your shoulder blades off the floor, then lower them, inhaling as you return to the starting position. Keep your eyes on the ceiling; try not to bend your neck forward. Repeat 15 to 30 times.

Purpose: Strengthen abdominals

Press Up

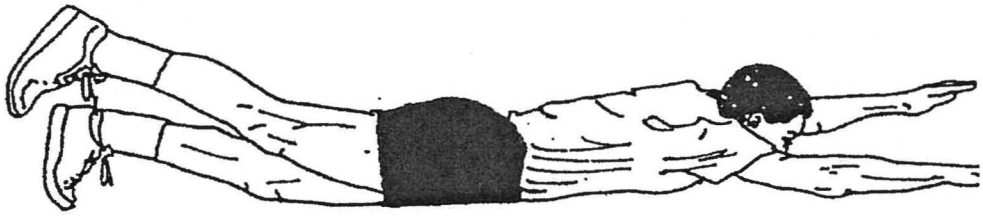


Lie facedown on the floor with your hands by your shoulders. Keeping your weight on your hands, use your shoulders and arms to push your head and upper trunk up; try to keep the other parts of your body relaxed. Do not use your back muscles to lift. Keep your pelvis on the floor. Hold the upper position for 2 seconds, keeping your eyes straight ahead, and then lower yourself. Repeat 5 to 10 times. Each time you repeat, extend your arms a bit farther.

Purpose: Stretch chest and abdominal muscles

Caution: If you are an older adult, consult with your physician before attempting the Press Up.

Prone extension

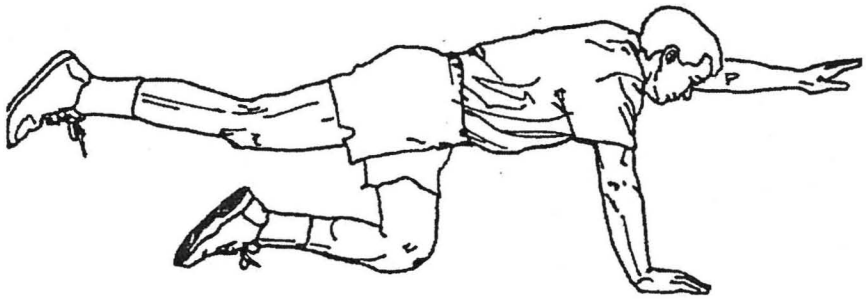


Lie facedown with your arms extended over your head on the floor. Exhale, slowly lift your left arm and right leg 6 to 12 inches (about 15 to 30 centimeters) off the floor, and hold for 3 to 5 seconds. Keep your eyes on the floor. Do not hold your breath. Lower your arm and leg, then do the same exercise using your right arm and left leg. Repeat 10 to 15 times per pair.

Purpose: Strengthen back extensors

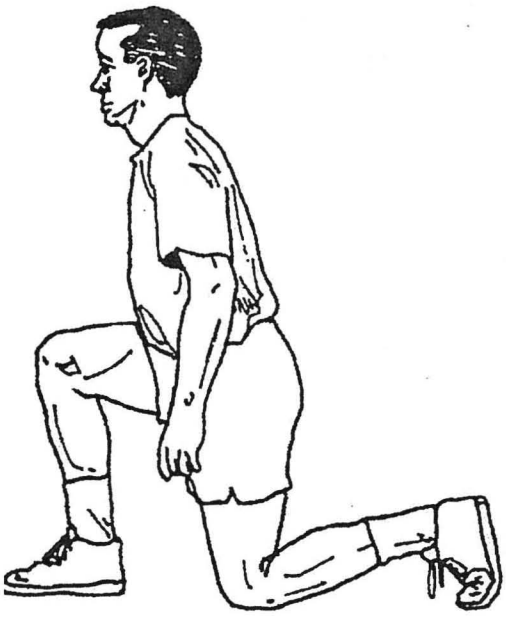
LEVEL 3

Quadruped (Advanced)



Get on all fours on the floor. Brace your pelvis by pulling in your abdominals and holding your back in a pain-free position. Slowly raise your left arm and right leg. Hold for 5 seconds. Do not allow your trunk to sag, and keep your eyes on the floor. Repeat the exercise using your right arm and left leg. Repeat 5 to 10 times per pair.

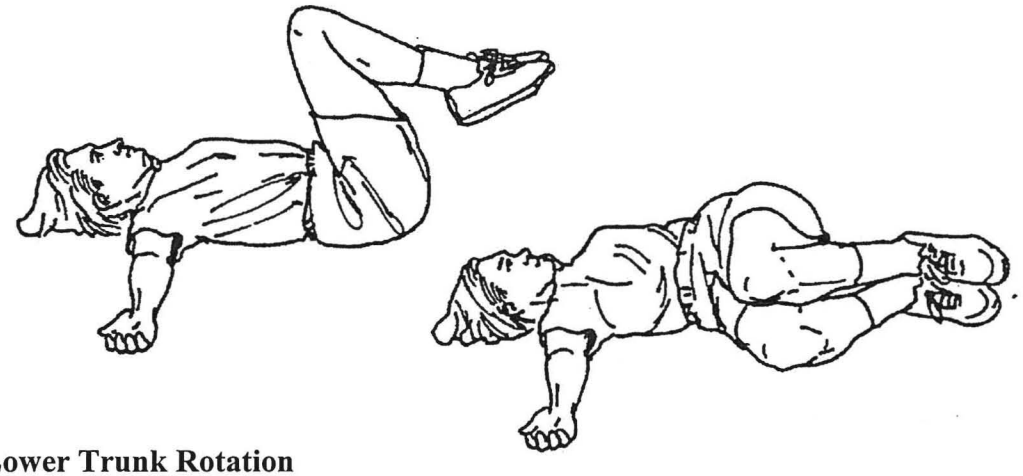
Purpose: Strengthen hip extensors



Hip Flexor Stretch (Advanced)

Stand with your feet shoulder-width apart, one foot forward and one foot behind you. Bend your forward leg, lowering your upright trunk (keep your back straight and tighten your abdominals). Place your back knee on the floor and lean forward slightly. Hold for 5 to10 seconds, looking straight ahead. Repeat 3 to 5 times per leg.

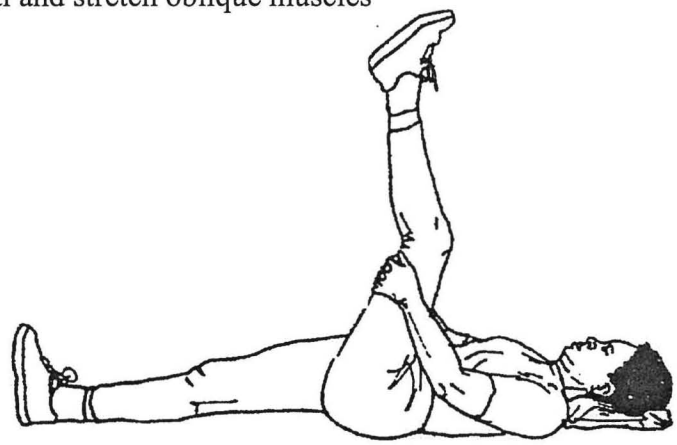
Purpose: Stretch hip flexors



Lower Trunk Rotation

Lie on your back with both knees bent and feet flat on the floor. Extend your arms out to your sides. Slowly bring both knees toward your chest. Then rotate your knees to one side as far as is comfortable. Hold for 5 seconds. Slowly bring both knees up and over to the other side as far as is comfortable. Hold for 5 seconds. Repeat 5 to 10 times.

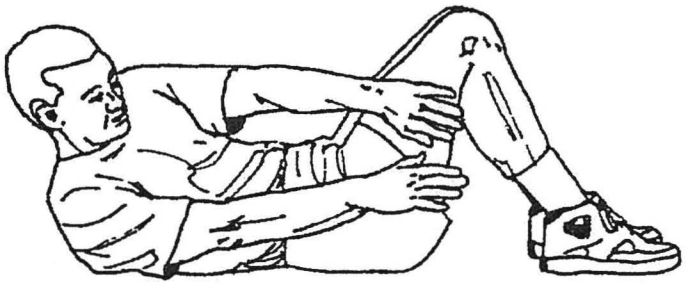
Purpose: Strengthen abdominal and stretch oblique muscles



Single Leg Raise (Advanced)

Lie on your back with both legs straight (or with both knees bent if you are uncomfortable when your legs are straight) and arms at your sides. (You may wish to place a small pillow under your head or neck.) Do a pelvic tilt and hold. Keeping your lower back in contact with the floor, slowly raise one extended leg as high as possible without pain. (Do not point or flex your foot.) After you have raised your leg as far as you can, keeping your knee straight but not locked, gently pull your leg closer to you as you contract the front of your thigh. Hold for10 seconds. Repeat 5 to 10 times per leg. Your goal should be to raise each leg a minimum of 80 degrees off the floor; the position of your pelvis makes this more difficult than the earlier exercise *if* both legs are straight when you start raising one leg.

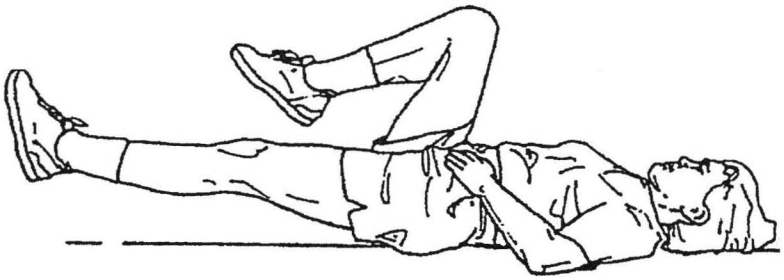
Purpose: Stretch hamstrings



Diagonal Curl

Lie on your back with both knees bent, feet flat on the floor, and arms at your sides. Exhale, and lift your trunk slightly. While lifting, rotate your trunk slightly by reaching both arms toward the right side of your right knee, lifting your left shoulder off the floor (your right shoulder may still be in contact with the floor). Look at your hands. Inhale, and lower your shoulder and head to the floor, then do the same to the left side. Repeat 10 to 15 times per side. For variation, reduce the number of repetitions but hold your right or left position by contracting your abdominals for 5 to 15 seconds. Be sure to continue doing trunk curls from Level 2 frequently so you work all of your abdominal muscles.

Purpose: Strengthen abdominal and oblique muscles

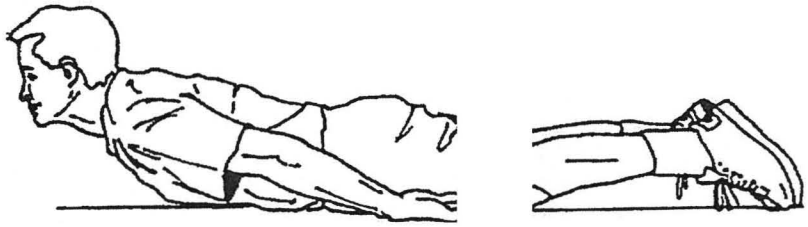


Supine Bracing

Lie on your back with your legs straight. Place your hands on your lower abdominals and pull them in, then do a pelvic tilt and hold. Keeping your lower back in contact with the floor, bring your right leg toward your chest while lifting your left leg off the floor. (Your left leg will be kept straight.) Then do the reverse, bringing your left leg toward your chest while straightening your right. Be sure you keep your abdominals right and your lower back on the floor. Repeat 10 to 20 times per leg:

Purpose: Strengthen postural muscles

Caution: If you must restrict your activity due to a cardiac condition, then do not perform Supine Bracing because this exercise requires strong isometric contraction (i.e., contraction against resistance) of your trunk muscles.



Upper Trunk Raise

Lie facedown on the floor, arms at your sides. Slowly elevate your head and shoulders from the floor. Raise them only to the point where you feel comfortable; don't force it. Keep your head in a neutral position; do not look up. Hold for 5 to 10 seconds. Repeat 5 to 10 times.

Purpose: Strengthen back extensors

Caution: Don't exceed the normal standing curvature of your lower back.

Exercise Log

Here is a sample weekly exercise log that you can copy to hand out to class participants and/or clients. Have them fill out this or a similar form so you can keep track of their progress.

YMCA Healthy Back Program Weekly Exercise Log

Name _____ Week of _____

Each week fill in the level of each exercise. Write in the number of repetitions performed daily.

Day	Postural strength	Back stretch	Hip flexor stretch	Hamstring stretch	Abdominal/ Chest stretch	Abdominal strength	Back extensor strength	Hip extensor strength
	Level	Level	Level	Level	Level	Level	Level	Level
Monday								
Tuesday								
Wednesday								
Thursday								
Friday								
Saturday								
Sunday								

Optional Healthy Back Exercises

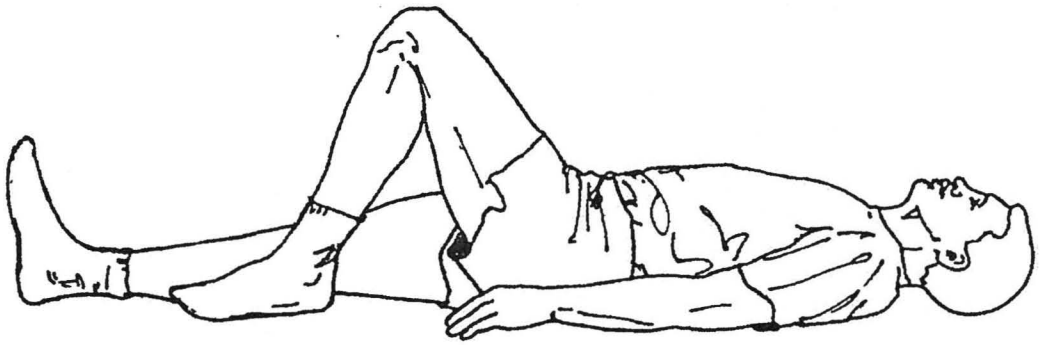
Week 1

The following 15 exercise are included as another option, **mainly for more deconditioned participants**. These exercises are easier to perform than most of the others in the program. The structure of this class is to progressively teach the exercises, starting with the first five and adding one each class and limiting repetitions to three of each exercise. Most YMCAs offer this option as a 6-week course that meets twice a week, using the following format:

Week	Class	Exercise Introduced
1	1	None (Review program theory, principles, and format)
2	2	1-5
	3	6
	4	7
3	5	8
	6	9
4	7	10
	8	11
5	9	12
	10	13
6	11	14
	12	15

Each exercise session always starts with Exercise 1, progresses to the new exercise introduced at that class, then reverses in order back to 1.

Here are the illustrations and instructions for the exercises. They are grouped by the week in which they are introduced (Week 1, Week 2, etc.). Copy these sheets and hand them out to your participants so they can practice at home as well as in class. Please note that exercisers should *not* wear shoes when performing these exercises.



Exercise 1: Leg Slide

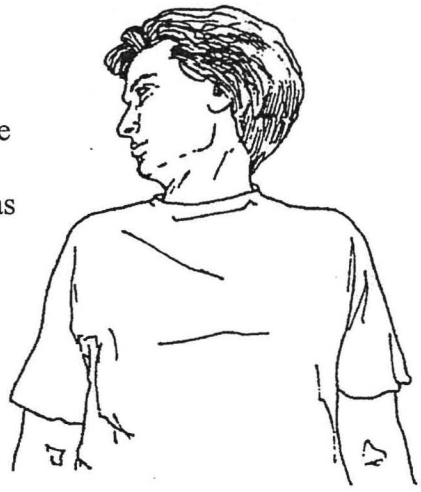
Lie comfortably on your back on a mat on the floor with both knees bent. Close your eyes. Take a deep breath and exhale slowly. Slide one leg out, letting it fall loosely to the floor, and slide it back. Slide the other leg out and slide it back. Repeat twice more.

Exercise 2: Shoulder Shrug

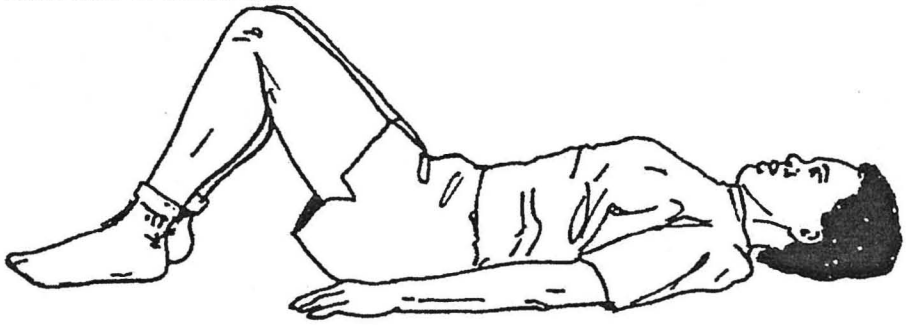
Lying on the mat, slowly shrug your shoulders up toward your ears, sliding them along the mat. Release the shrug. Repeat 2 more times.

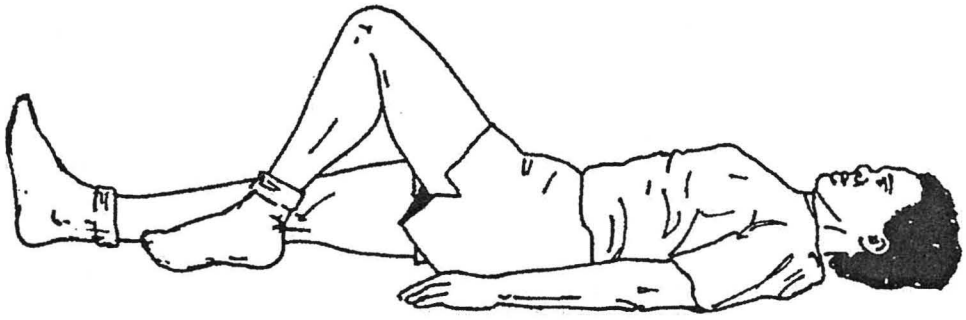
Exercise 3: Head Roll

Lying on the mat, turn your head slowly to one side, letting it fall loosely toward the floor. Slowly swing the head to the other side, letting it go loosely as far as it can. Do not force or strain. Turn 3 times to each side.



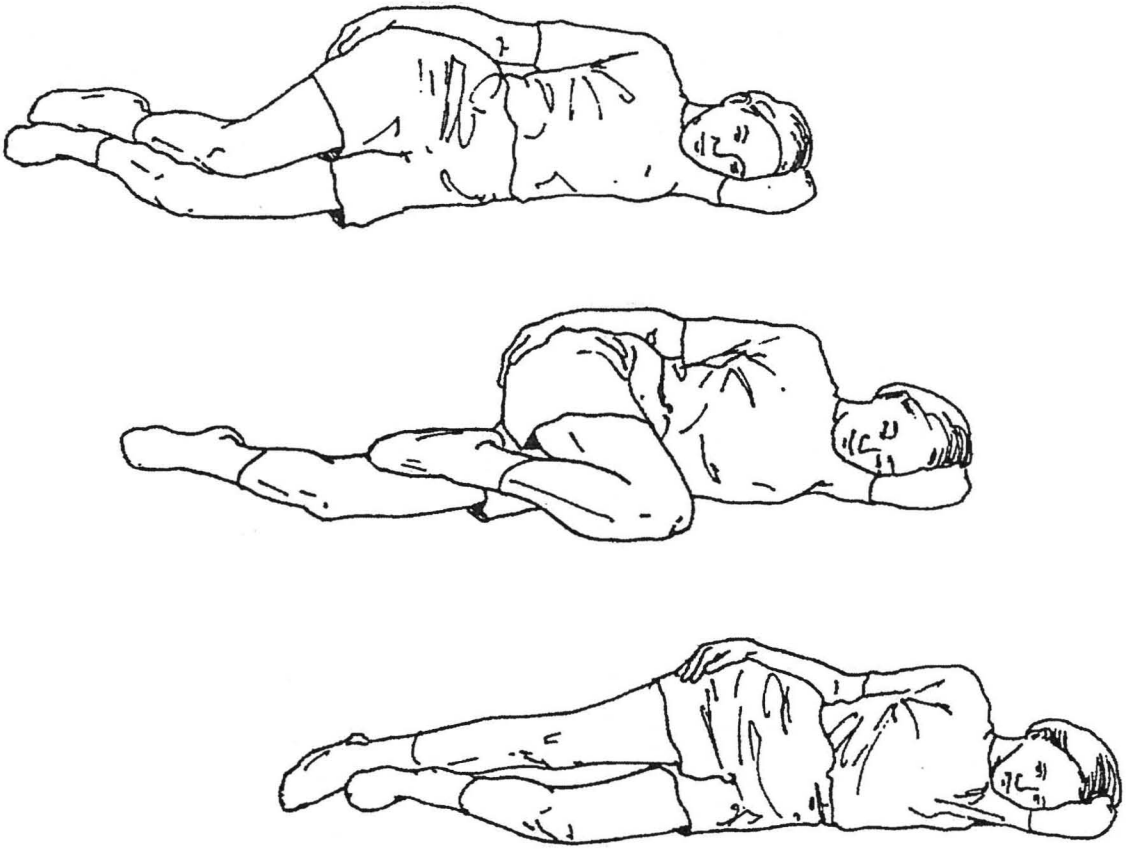
Exercise 4: Knee Lift





Slowly draw one knee up toward your chest, keeping your hips on the floor. Return your foot to the floor, slide your leg out, and then slide it back. Now bring the other leg up, return your foot to the floor, slide your leg out, and slide it back. Perform the exercise 3 times for each leg.

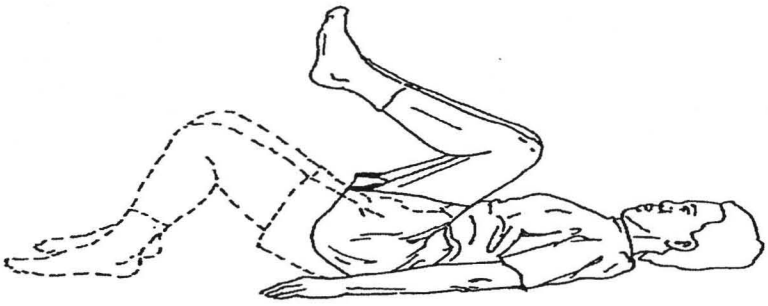
Exercise 5: Side Leg Slide



Lay on one side with your head resting comfortably on your bottom arm. Keep both knees flexed and your hips slightly flexed. Slide your top knee along the floor up toward your shoulder, then slowly extend the leg until it is completely straight, and return your knee to the bent position. The leg is dead weight. Do the exercise 3 times, then turn to your other side and repeat exercises.

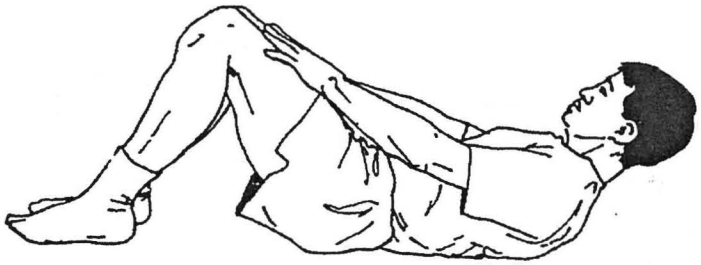
Week 2

Exercise 6: Double Knee Flex



Lie on your back with both knees flexed. Raise both knees up toward your chest. Then lower your legs gradually to the floor in the flexed position. Do not raise your hips off the floor. Do the exercise 3 times.

Exercise 7: Head and Shoulders Curl Up

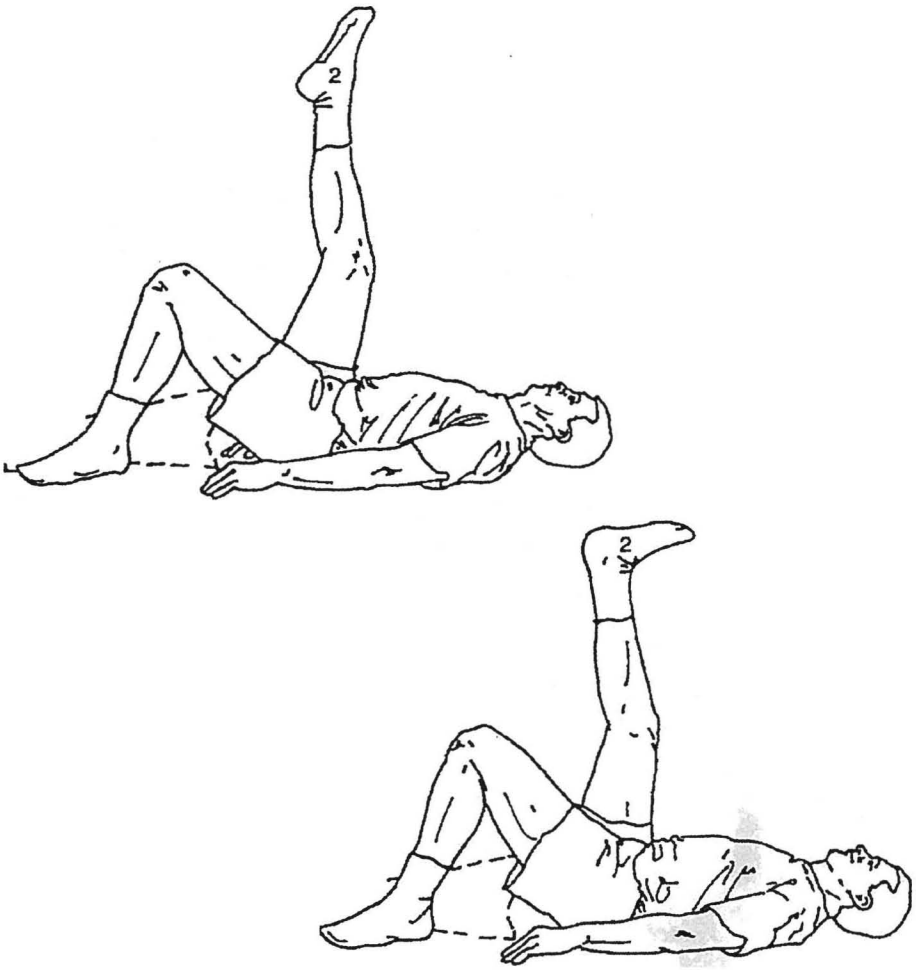


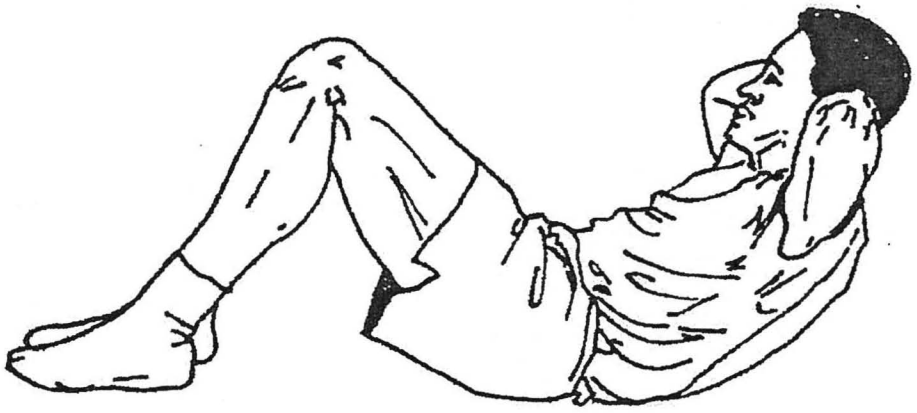
Lie on the floor with knees flexed, hands resting on your thighs. Take a deep breath and raise your head and shoulders off the floor in a curling motion, sliding your fingertips toward your knees, exhaling as you come up. Lower down slowly, and let go. Do the exercise 3 times.

Week 3

Exercise 8: Hamstring/Calf Stretch

Lie on your back with both knees flexed, arms at sides. Bring one knee up toward your chest, then extend your leg, pointing your toes toward the ceiling. Keep your knees straight, holding for 5 seconds. Lower the straight leg to the floor. Then slide the leg back to the bent position. Do the same for the other leg. Then bring the first knee toward the chest, flex the foot, extend the leg, and hold. Lower the straight leg to the floor, and slide the leg to the bent position. Do the same for the other leg. Repeat the entire sequence once more.



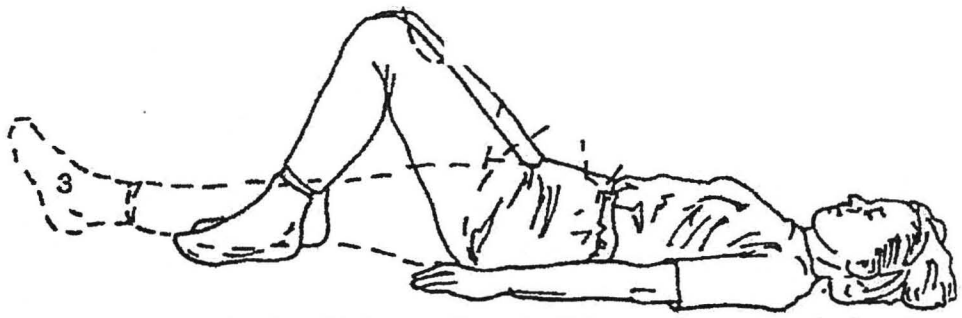


Exercise 9: Half Sit-up

Lie on your back with your hands at the sides of your head, knees flexed. Take a deep breath, and slowly curl up to a half-sitting position, exhaling as you do. Lower yourself slowly to a lying position. You should sit up gradually, starting by raising your head, then your shoulders, and then your upper back. Keep your lower back on the mat. If you cannot do this exercise with your hands on your head, try to do it with your hands on your thighs. Do the exercise 3 times.

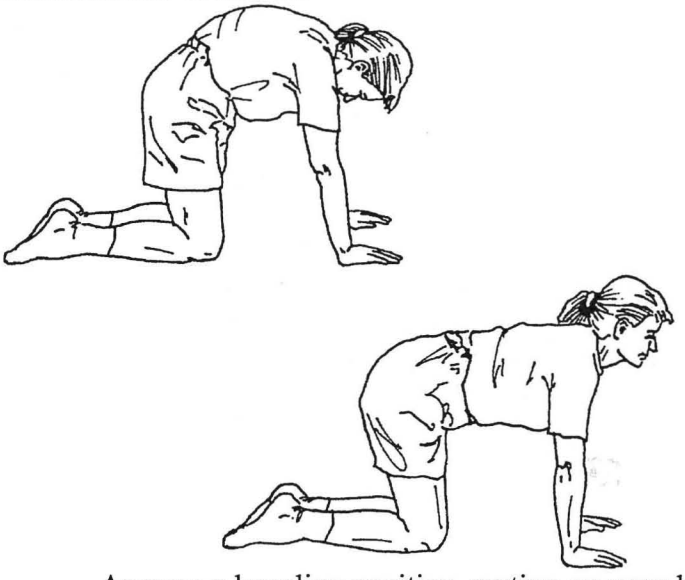
Week 4

Exercise 10: Hamstring/Calf Stretch 2



Lying on your back with knees flexed, slide one leg out, pointing the toes away from the head. Raise your straight leg as high as you can without bending it, and hold. Lower your straight leg to the floor and slide the leg back to the bent position. Do the same for the other leg. Then slide the first leg out, flex the foot, and raise the straight leg as high as you can. Hold for 5 seconds. Return the straight leg to the floor and slide it back to the bent position. Repeat with the other leg. Repeat the entire sequence one more time.

Exercise 11: Cat Back

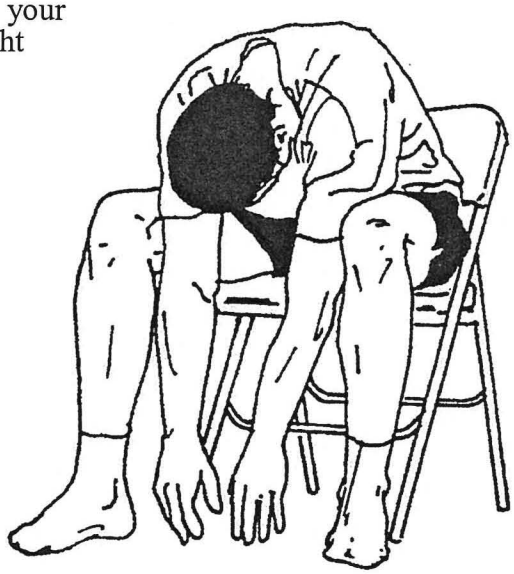


Assume a kneeling position, resting on your hands and knees. Arch your back up like a cat, lowering your head at the same time. Then let go, lowering your back and raising your head, returning to a flat back position. Do the exercise 3 times.

Week 5

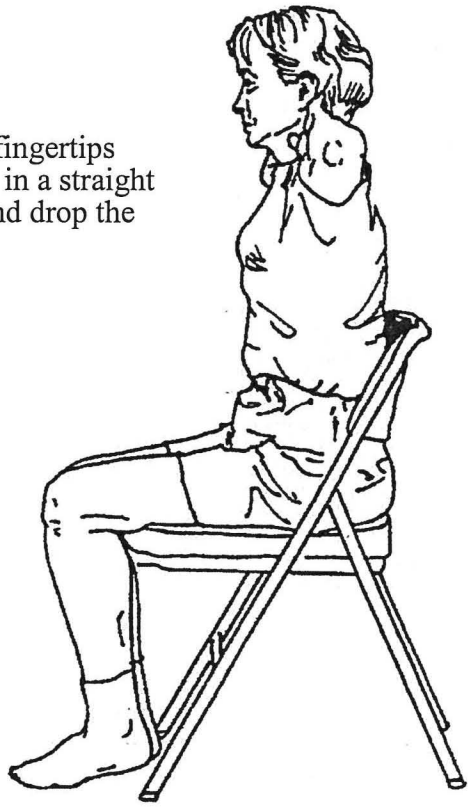
Exercise 12: Forward Bend Sitting

Sit on a chair, feet apart and flat on the floor, hands resting on thighs. Let your neck droop, then drop your shoulders and arms, and bend down between your knees, as far as you can. Slowly return to an upright position, and let go. Do not force the downward bend. Do the exercise 3 times.



Exercise 13: Pectoral Stretch Sitting

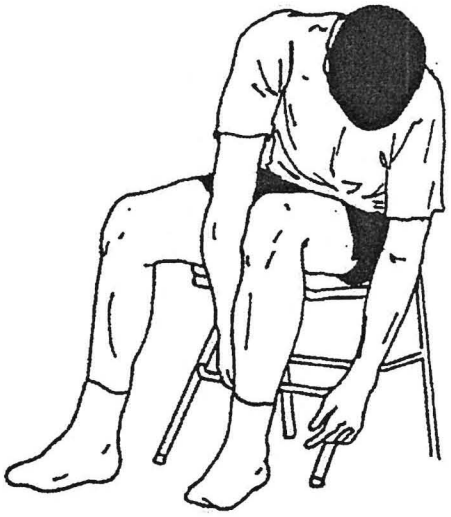
Sit straight in a chair, hands behind the neck, fingertips touching. Slowly press the elbows back until they are in a straight line with the head. Hold for 5 seconds, then release and drop the arms to the sides. Do the exercise 3 times.



Week 6

Exercise 14: Side Bend Sitting

Sit on a chair, one arm between the legs, the other arm to the side. Bend down to the side of the outside arm, dropping your head and shoulders. Hang loosely. Slowly straighten up and do the exercise again, bending to the other side. Keep your legs slightly apart as you bend to the sides. Do the exercise 3 times.



Exercise15: Forward Bend Standing

Stand with feet shoulder-width apart, knees slightly bent. Umber your legs by shaking them loose. Drop your neck gradually and let your trunk "hang" loosely from your hips. Drop your shoulders and then your back gradually. Let gravity help you. Completely relax, "hanging from the hips," reaching toward the floor with your fingertips. Slowly straighten the knees, hold for 5 seconds, then release. Raise up, bending the knees. Repeat 2 more times. Under your legs after the third repetition.

Exercise Log

On the next page is a sample exercise log for the Y's Way to a Healthy Back exercises. It covers all 6 weeks of the program. Copy this or a similar log and hand it out to class participants and/or clients so they can keep track of their exercise sessions.

Y's Way to a Healthy Back Daily Exercise Log

This daily exercise routine can help you maintain a healthy back, avoid back injuries, and relieve back problems.
Use this daily log to help you keep track of your progress on the road to a healthier back.

EXERCISE	Week 1							Week 2							Week 3							Week 4							Week 5							Week 6						
	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
1. Leg Slide																																										
2. Shoulder Shrug																																										
3. Head Roll																																										
4. Knee Lift																																										
5. Side Leg Slide																																										
6. Double Knee Flex																																										
7. Head and Shoulder Curl Up																																										
	8. Hamstring/Calf Stretch 1																																									
	9. Half Sit-Up																																									
	10. Hamstring/Calf Stretch 2																																									
	11. Cat Back																																									
	12. Forward Bend Sitting																																									
	13. Pectoral Stretch Sitting																																									
	14. Side Bend Sitting																																									
	15. Forward Bend Standing																																									

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CHAPTER V

SUMMARY

Back pain is one of the most pervasive medical problems in our society (Muir, T.W., 1994, p. 66). NIOSH reported that "back injuries account for nearly 20% of all injuries and illnesses in the workplace." According to the Bureau of Labor Statistics, "more than one million workers suffer back injuries each year, and back injuries account for one of every five workplace injuries or illnesses" (OSHA, 1993, p.1). Back injuries and back injury claims cost the nation an estimated 20 to 50 billion dollars per year (NIOSH, 1997) and according to National Strength and Conditioning Association (NSCA, 2001) back injury costs are approaching 100 billion dollars annually.

Firefighters place a great deal of stress on the low back by the difficult tasks they undertake in the line of duty such as lifting and carrying heavy or awkward loads in dangerous situations. "Back injuries are the most prevalent injury due to all the demands placed on a firefighter's body" (Pettit, J.L., 2004, p. 3). According to the International Association of Fire Fighters (IAFF, 1998), "sprains and strains were the leading on-duty injuries, 43.9%, with the highest being injuries to the back, 44.7%" (p. 11).

Preventing back injuries is a major workplace safety challenge. While such injuries can't be avoided entirely, ergonomically appropriate fire facility design, in conjunction with smarter work habits, and a strong core fitness program could help limit firefighter injuries (Fire Chief, 2003).

These high costs and injury numbers are a national concern for firefighters as well as the Casper Fire Department (CFD). The methodolgy utilized included a review of the literature to identify the best practicies for a fitness program designed for firefighters. In addition, both an analysis of the current Casper Fire Department fitness program and their essential job functions was performed. After completing a review of the literature and the analysis of the CFD, it was found that there was a need for a core-strengthening program to improve current back heath and prevent future back injury.

The result of this scholarly project was the development of a Core Strengthening and Injury Prevention Program for firefighters at the Casper Fire Department integrating job analysis and ergonomic factors. The protocol includes two sections, the Core Strengthening Program and the YMCA *HealthyBack* Program. Both the Core Strengthening Program and the YMCA *HealthyBack* Program are designed as guides to aid in the prevention of back injuries and provide the necessary information to maintain or achieve a healthy back. Each section includes: a) the title of each section, b) a brief description of each section, c) exercise descriptions and d) definitions of basic terminology. Within each section is a three phase program that concentrates on strengthening the core muscles which include; the abdominal muscles, the inner muscles of the pelvic floor and increasing flexibility in conjunction with strengthening the lower back muscles to decrease the rate of back injuries.

Implementation of one of the two included programs will address the need of firefighters to increase their core strength, which will in turn help prevent back injuries. In addition to addressing the physical needs of the firefighter, the program is also designed to address the psychosocial/emotional issues related to being a firefighter.

Many of the emotional challenges that firefighters experience are internal and external stressors. These stressors include irregular work hours, sleeplessness, and time management; as firefighters respond from inactivity to vigorous activity within seconds. They also encounter unusual and disturbing situations such as dealing with attempted suicides, survivors of vehicle accidents, and structure fires. Firefighters view stress as a normal part of the job and see themselves under more stress today than their colleagues were ten to twenty years ago (Shell, 2003). The programs are designed to address the psychological needs of the firefighter, decrease the frequency and amount of back injuries sustained by CFD firefighters on the job and increase their overall quality of life.

Through the examination and analysis of the fitness program at the CFD, it is concluded that Occupational therapy is critical to ensure CFD firefighters attain and maintain core strength and quality of life. The occupational therapist (OT) has professional skills that allow identification of behaviors and practices that contribute to back injuries. An OT can design and implement a comprehensive, integrated program that focuses on injury prevention and wellness by identifying and eliminating risk factors related to back injury and the resulting stress so the direct and indirect costs are minimized for the individual, the department and the community. The OT is key since he or she can not only oversee the exercise training and education they are also trained to identify harmful work habits, poor job design through ergonomic and job analysis evaluations as well as psychosocial issues related to injury.

Limitations

The limitations of the scholarly project are as follows;

1. This protocol was designed specifically for the Casper Fire Department based upon their specific needs assessment and it is not applicable to all firefighters or fire stations.
2. This protocol is not designed to treat a firefighter with a preexisting back injury.
3. Some participants may start a program and fail to complete it. All participates should encouraged complete all levels in order to receive maximum benefits.

Clinical Implications & Recommendations

1. Each firefighter should be individually evaluated and assessed to determine the appropriate needs and exercise protocol.
2. Each Fire Station should be evaluated to assure all necessary equipment is available for all levels of the selected program.
3. Outcome measures should be recorded to demonstrate the beneficial statistics and add to the body of knowledge regarding evidenced based practice of the protocol.
4. Any fire department wishing to adopt this program would be advised to employ an Occupational Therapist to perform the needs assessment.

Appendix A
Firefighter Schedule

CASPER FIRE DEPARTMENT
2003 FIREFIGHTERS SHIFT SCHEDULE

A SHIFT B SHIFT C SHIFT

JANUARY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

FEBRUARY

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

MARCH

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

APRIL

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MAY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

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CASPER FIRE DEPARTMENT

2004 FIREFIGHTERS SHIFT SCHEDULE

A SHIFT B SHIFT C SHIFT

JANUARY

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DECEMBER

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Appendix B
Needs Assessment Results

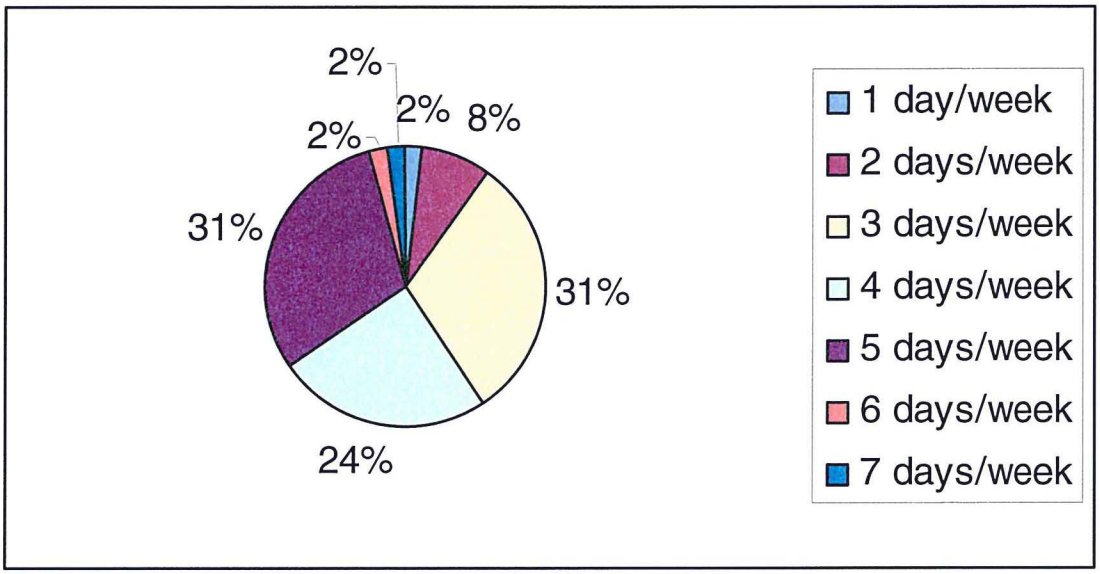

Figure 1.
Responses to question #1: "How many days per week do you work out?"

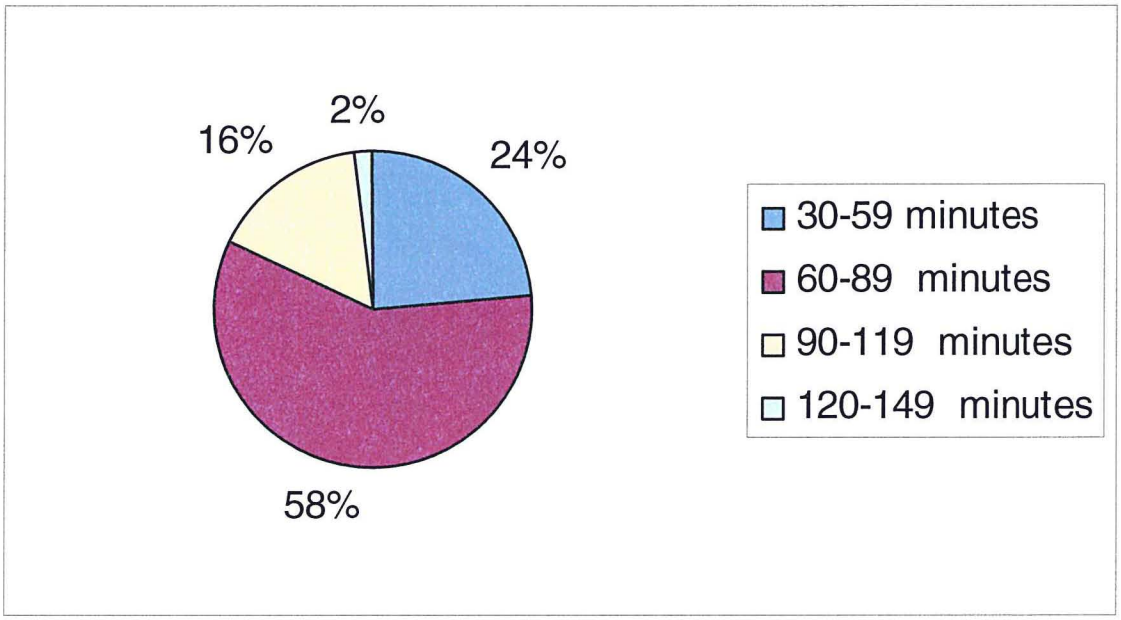

Figure 2.
Response to question #2: "How long is your typical workout session?"

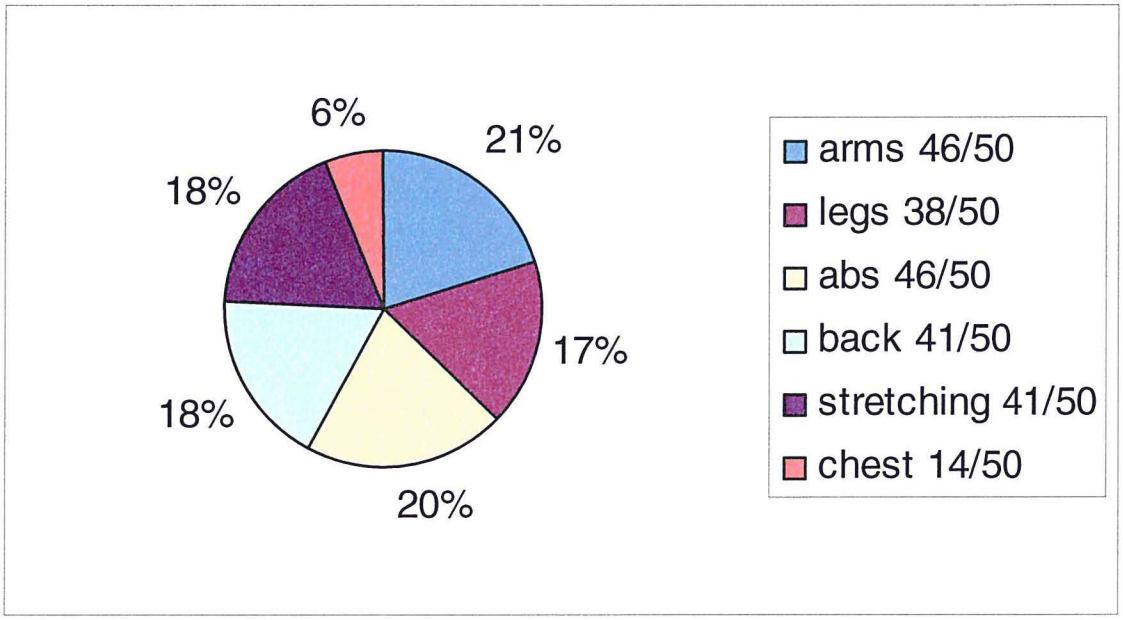

Figure 3.
Response to question #3: Non cardio-vascular strength training breakdown.

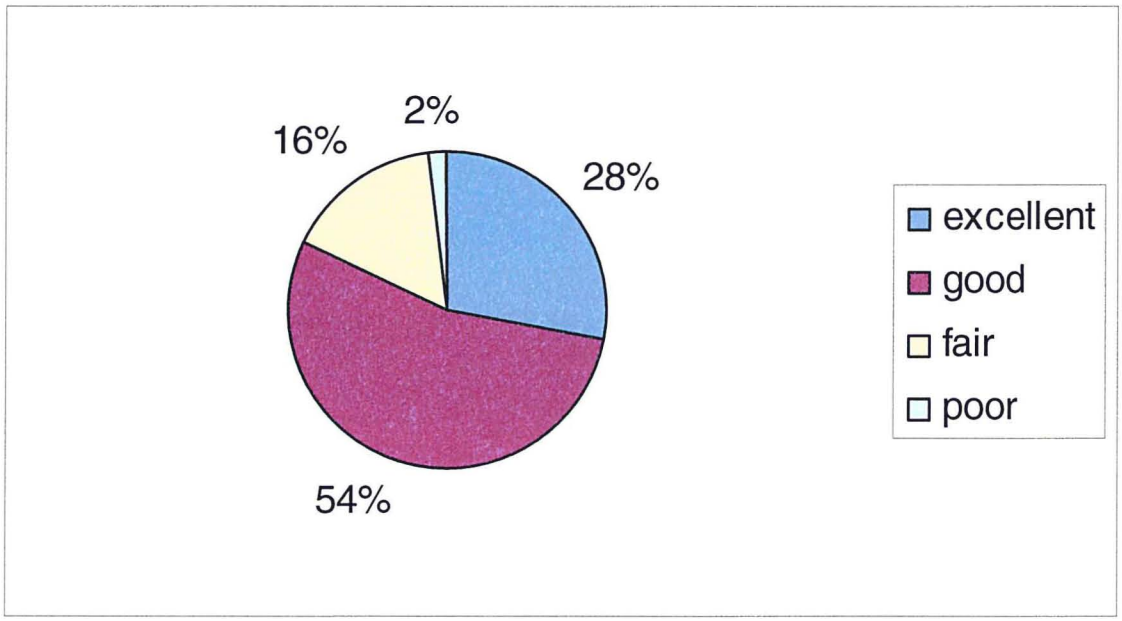

Figure 4.
Response to question #4: "How would you describe your back health?"

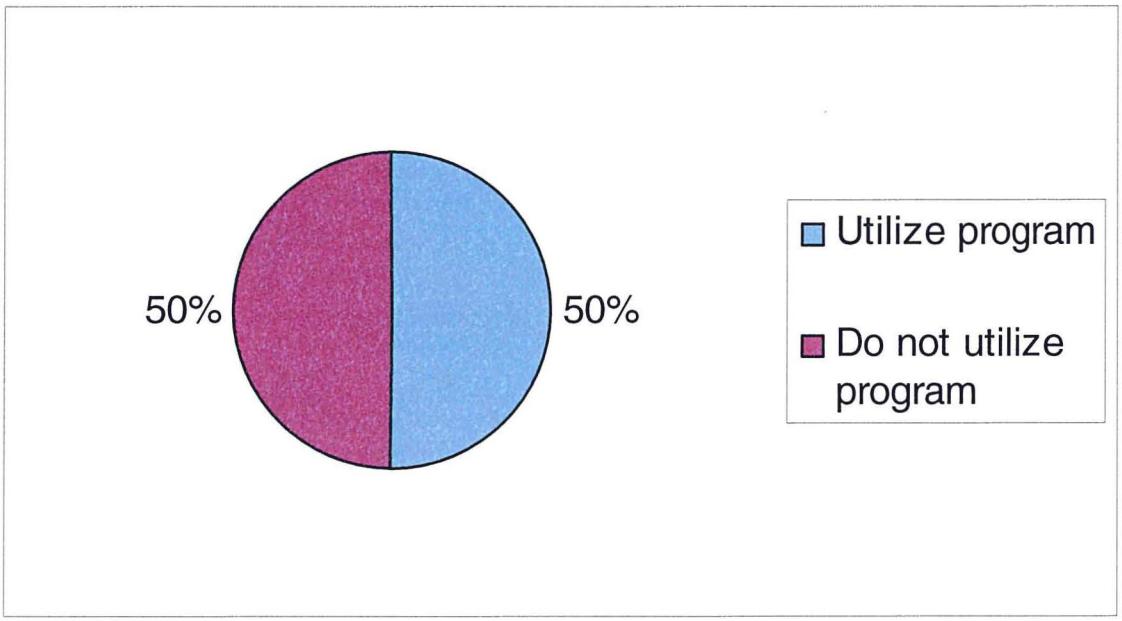

Figure 5.

Response to question #5: "Do you currently utilize a back strengthening program?"

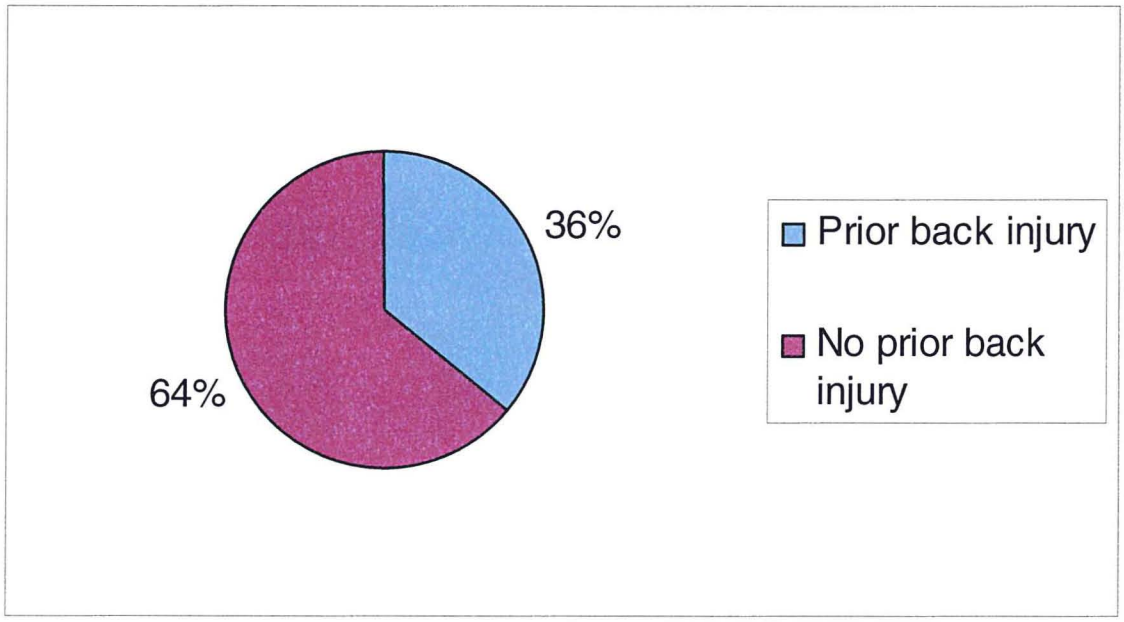

Figure 6.
Response to question #6: " Did you have a prior back injury?"

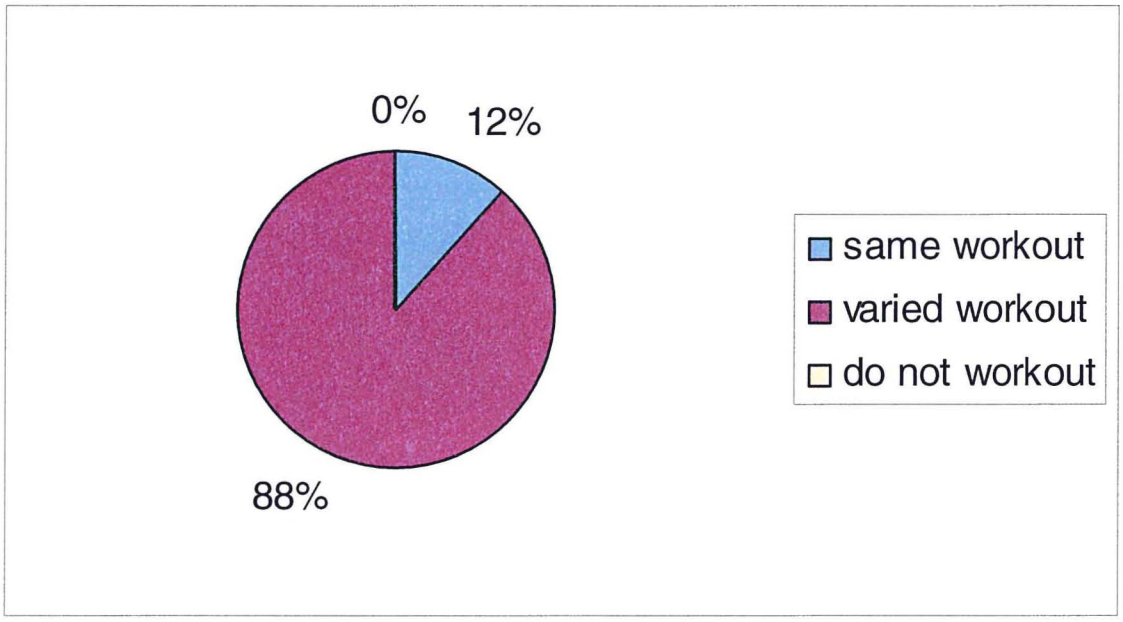

Figure 7.

Response to question #7: "Do you follow the same workout schedules or does it vary?"

Appendix C
Needs Assessment Interpretation

Needs Assessment Interpretation

Fifty firefighters from the five Caper Fire Department (CFD) stations were surveyed regarding their fitness habits. Of the 50 surveyed, all participants reported working out at least one day per week. Two percent reported working out one time per week. Eight percent reported working out twice per week. Thirty-one percent reported working out three times per week. Twenty-four percent reported working out four times per week. Thirty-one percent reported working out five times per week and two percent reported working out both six and seven days a week. These responses supported the need for a Core Strengthening Program at the CFD.

The typical duration for a workout session among firefighters was 60 to 89 minutes per session. Fifty-eight percent of firemen surveyed fell into this time range. Twenty-four percent reported typical workouts to last between 30 and 59 minutes. Sixteen percent stated their workouts last between 90 and 119 minutes, and two percent reported working out for more than 120 minutes. The majority of the firefighters exercises spend sufficient time to participate in a well-rounded, full body workout.

Within the CFD firefighter's reported workout regimen 46 of the 50 surveyed worked their arms and abdominal muscles. Forty-one out of 50 firefighters reported doing back strengthening exercises and stretching. Leg exercises were reported by 38 out of the 50 surveyed. In the blank space left next to "other", fourteen of the firefighters wrote in "chest" as their other exercises.

When asked about personal back health, twenty-eight of the firefighters felt their backs were in "excellent" condition. Fifty-four percent felt they had "good" back health, sixteen percent reported "fair" back health, and two percent reported "poor" back health.

According to firefighter's self-reports, the majority of those surveyed described their back health as acceptable.

Half of the firefighters surveyed currently utilize a back strengthening program and half do not. This indicates that there is a need for further education and implementation on back health and its importance. Physical fitness injury prevention was the main concern of Chief Young. These data support his cause for concern as in 2002-2003 the CFD spent a total of $87,156.91 on back injuries.

When asked about previous back injuries, 36% of the firefighters surveyed reported that they had suffered a back injury in the past. The remaining 64% of the surveyed firemen have not sustained a back injury thus far. The implementation of a Core Strengthening Program will continue to benefit firefighters through injury prevention and improve back health of firefighters with previous back injuries.

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