

**CASE STUDY** PENSACOLA FIRE DEPARTMENT

# REDUCING INJURY RISK FOR OCCUPATIONAL ATHLETES

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Balancing physical fitness with movement training  
to improve performance



# OUR STORY

## PIONEERING HUMAN PERFORMANCE.

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Performance is about achieving what matters to you, and that's what matters to us.

We believe taking control of personal health and performance is a universal challenge. From software engineers to sports stars, people want to improve every day — and not just at work.

That's why we've created a platform for achievement that any organization can use to help all its people reach their potential. After all, the well-being and performance of every person on a team are vital to its success.

# BACKGROUND

## THE POWER OF PROPER MOVEMENT



The University of Waterloo partnered with EXOS to evaluate how different training methods impact firefighters' physical fitness and functional movement quality, and how both ultimately affect their ability to perform their job duties.

Given the high prevalence of injuries among firefighters, our goal was to analyze how proper movement can translate to improved durability and quality of life.

### DEFINING PROPER MOVEMENT

At EXOS, we define movement quality by the positions people can get into, their movement patterns from position to position, and the power they're able to exhibit through those patterns.

### WHY MOVEMENT MATTERS

Every time someone moves, energy travels throughout their body, but moving incorrectly can cause energy to leak along the way. This places stress on joints and muscles in a way the body can't efficiently handle, ultimately increasing injury risk and pains that can hinder job performance.

### THE BIGGER PICTURE

If we could use movement-focused training to help firefighters improve their physical fitness as well as the way they move their bodies, the same training method could benefit other occupational athletes, such as police officers, soldiers, construction workers, and delivery drivers.

# OUR APPROACH

## FOCUSING ON *HOW* EXERCISES ARE PERFORMED

### BASELINE EVALUATIONS



When performed with poor movement quality, these movements are also linked to incorrect spine and lower body mechanics that can lead to injury and pain in the feet, ankles, hips, and low back. Firefighters also completed a comprehensive fitness test and Functional Movement Screen to evaluate their overall physical fitness and movement quality.

### TRAINING INTERVENTION

After initial evaluations, firefighters were divided into three training groups – two intervention groups and one control group. They trained three times a week for 12 weeks, and each training session lasted an hour and a half. There were no significant differences in each group's average age, weight, or functional movement score when their training began.

#### GROUP ONE MOVEMENT AND FITNESS TRAINING

Group one's coach and training program focused on improving movement quality in addition to physical fitness, guided by EXOS' training philosophy. Feedback reinforced movement strategies thought to decrease injury risk, such as resolving uncontrolled spine motion.

#### GROUP TWO CONVENTIONAL FITNESS TRAINING

The second group's coach and training program focused on making firefighters as physically fit as possible, following guidelines from a standard firefighter training program. The coach monitored technique for safety purposes but mainly encouraged the firefighters to complete repetitions and increase weight without commenting on their quality of movement.

#### GROUP THREE CONTROL GROUP, NO TRAINING INTERVENTION

The last group acted as the control group. They maintained their normal fitness and training routines and acted as the benchmark to measure the other two groups against.

### POST-TRAINING EVALUATIONS

After 12 weeks, researchers retested the firefighters using the same evaluations that were used prior to the training period and analyzed the impact of each training intervention.

# RESULTS

## IMPROVED PERFORMANCE ON JOB-RELATED TASKS FOR MOVEMENT-TRAINED FIREFIGHTERS

Both intervention groups showed improved physical fitness in the form of improved body composition, aerobic capacity, strength, endurance, and upper and lower body power. However, the firefighters who trained based on EXOS' movement methodology showed greater improvement on job specific tasks without any negative changes to their movement patterns.

They had cleaner movements, avoiding faulty spine and lower body mechanics that can lead to injury over time. Meanwhile, the group that trained based on conventional fitness programming showed negative performance changes on almost all job-related tasks.

### PHYSICAL FITNESS

The group with movement and fitness training significantly improved in 9 of 11 traditional fitness markers.

The group with conventional fitness training significantly improved in 8 of 11 traditional fitness markers.

GROUP	BODY FAT	VO2	LEFT PLANK	RIGHT PLANK	FRONT PLANK	BIERING SORESENSEN TEST	LEFT GRIP	RIGHT GRIP	MAX PUSHUPS	VERTICAL JUMP	SIT AND REACH
MOVEMENT & FITNESS-TRAINED GROUP	+	+	-	-	+	+	+	+	+	+	+
CONVENTIONAL FITNESS-TRAINED GROUP	+	+	+	-	+	+	+	-	+	+	-
CONTROL GROUP	-	-	-	-	-	-	+	-	+	-	-

+ Positive Adaptation   
 - Negative Adaptation   
 - No Significant Change

### MOVEMENT QUALITY

The group with movement and fitness training improved in all five job-related movements without any negative adaptations.

While the group with conventional fitness training did display some positive adaptations, they still displayed negative adaptations in 4 of the 5 job-related movements.




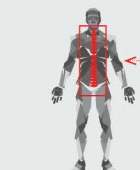
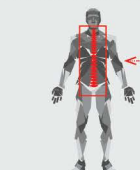
GROUP	SQUAT	LUNGE	PUSH	PULL	LIFT
MOVEMENT & FITNESS TRAINED GROUP	+	+	+	+	+
CONVENTIONAL FITNESS TRAINED GROUP	-	-	-	-	-
CONTROL GROUP	-	-	-	-	-

+ Positive Adaptation   
 - Negative Adaptation   
 - No Significant Change

# RESULTS

## IMPROVED PERFORMANCE ON JOB-RELATED TASKS FOR MOVEMENT-TRAINED FIREFIGHTERS

More injuries mean less efficient work and more turnover. As a result, poor movement quality not only affects occupational athletes but their employers, too.

THE MOVEMENT	HOW IT AFFECTS OCCUPATIONAL ATHLETES	HOW IT AFFECTS EMPLOYERS
<p><b>LIFT</b> USED WHEN PICKING UP EQUIPMENT</p> 	<p>RISK OF INJURY TO THE BACK AND KNEES INCREASES BECAUSE WITHOUT EFFECTIVE TRANSFER OF ENERGY FROM JOINT TO JOINT, FORCE GOES TO THE SPINE AND KNEES WHEN IT SHOULD GO TO THE HIPS.</p>	<p>ACCORDING TO THE INTERNATIONAL ASSOCIATION OF FIREFIGHTERS, BACK INJURIES ACCOUNT FOR APPROXIMATELY 50 PERCENT OF RETIREMENTS DUE TO LINE-OF-DUTY INJURY EACH YEAR - AND THEY'RE THE MOST EXPENSIVE TO TREAT. ADDITIONALLY, SPRAINS AND STRAINS ROUTINELY ACCOUNT FOR APPROXIMATELY 50 PERCENT OF LINE-OF-DUTY INJURIES AND, ACCORDING TO THE U.S. FIRE ADMINISTRATION, SPRAINS AND STRAINS ACCOUNTED FOR 57 PERCENT OF INJURIES TO LOWER EXTREMITIES OVER A THREE-YEAR PERIOD.</p>
<p><b>SQUAT</b> USED WHEN SETTING DOWN EQUIPMENT</p> 		
<p><b>LUNGE</b> USED WHEN PICKING UP AND SETTING DOWN EQUIPMENT</p> 	<p>RISK OF INJURY TO THE BACK AND KNEES INCREASES BECAUSE WITHOUT A STABLE TORSO, FORCE GOES TO THE SPINE AND KNEES WHEN IT SHOULD GO TO THE HIPS.</p>	
<p><b>PUSH</b> USED WHEN PUSHING A DOOR, BOX, OR DOLLY</p>  <p>REDUCED SPINE TWISTING MORE EFFECTIVELY TRANSFERS FORCE FROM THE LOWER BODY TO THE UPPER BODY, REDUCING INJURY RISK.</p>	<p>WITHOUT A STABLE SPINE AND SHOULDER COMPLEX, FORCE GOES TO THE ROTATOR CUFF, NECK, AND SHOULDER JOINT LIGAMENTS, INCREASING RISK OF PAIN AND INJURY.</p>	<p>ACCORDING TO THE U.S. FIRE ADMINISTRATION, FIRE-RELATED INJURIES RESULTED IN LOSS OF WORK TIME FOR 44 PERCENT OF FIREFIGHTERS DURING A THREE-YEAR PERIOD. INJURIES TO THE ARMS, HANDS, LEGS, AND FEET MADE UP 42 PERCENT OF THOSE FIRE-RELATED INJURIES WHILE INJURIES TO THE HEAD AND SHOULDER REGIONS MADE UP AN ADDITIONAL 26 PERCENT. 14 PERCENT OF THESE INJURIES WERE DUE TO SPRAINS AND STRAINS.</p>
<p><b>PULL</b> USED WHEN MANEUVERING A HOSE, DOLLY, OR OTHER HEAVY EQUIPMENT</p>  <p>REDUCED SPINE TWISTING MORE EFFECTIVELY TRANSFERS FORCE FROM THE LOWER BODY TO THE UPPER BODY, REDUCING INJURY RISK.</p>		

# RESULTS

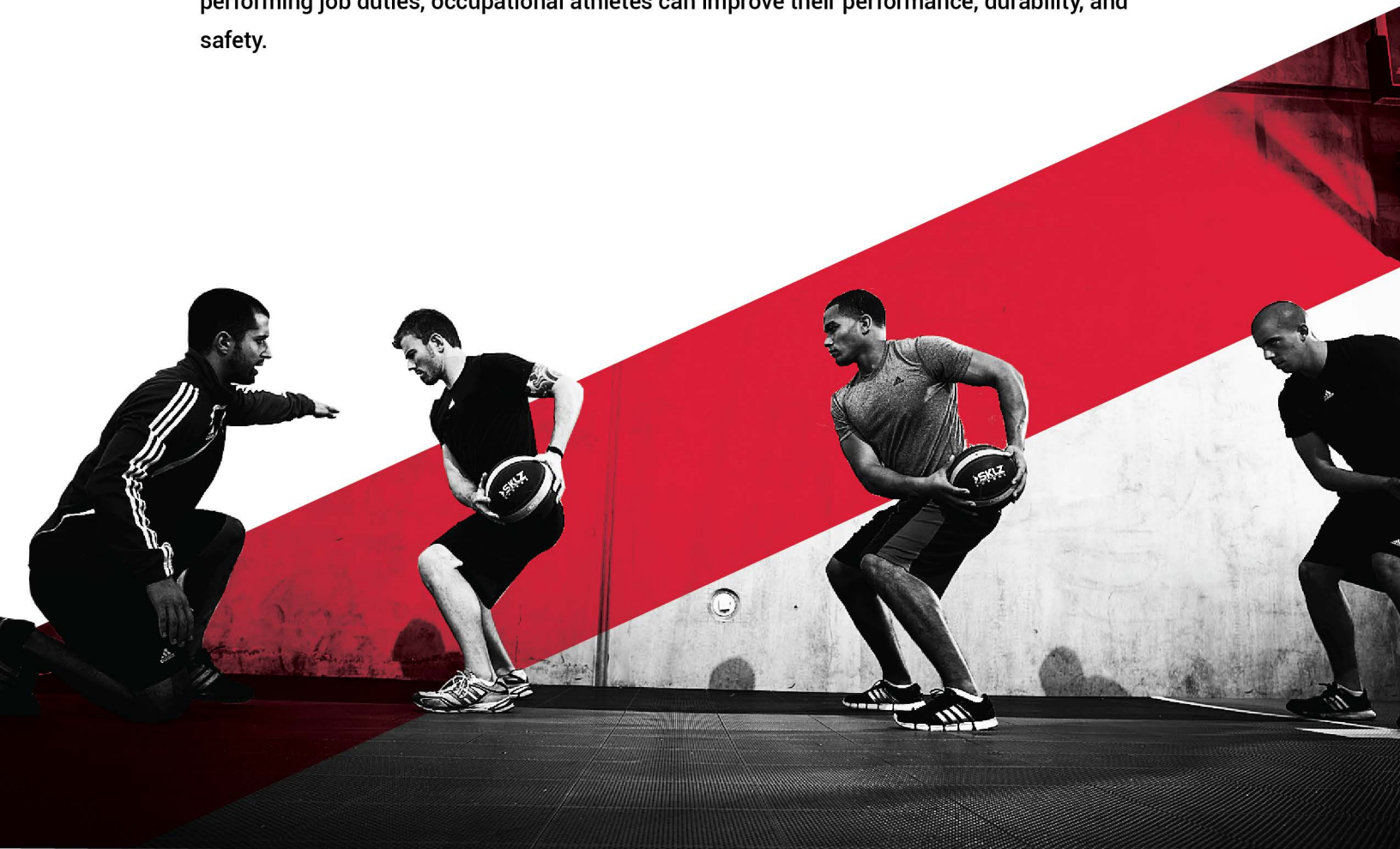
## IMPROVED PERFORMANCE ON JOB-RELATED TASKS FOR MOVEMENT-TRAINED FIREFIGHTERS

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### THE FINAL SAY

While standard firefighter fitness programs may be enough to keep firefighters physically fit, being physically fit without great movement quality may not properly prepare them to perform their job duties or sustain long-term careers.

By introducing a movement-centered approach to both the fitness environment and while performing job duties, occupational athletes can improve their performance, durability, and safety.



# TESTIMONIALS



**MY MOVEMENT HAS IMPROVED SINCE ATTENDING EXOS... MY RANGE OF MOTION IS AS GOOD AS IT WAS 20 YEARS AGO.**

**KEVIN O.,**  
BATTALION CHIEF AND  
EXOS FIREFIGHTER MENTORSHIP PARTICIPANT



The fitness level of our recruits continues to elevate during our academies with minimal to no fitness related injuries. This is definitely an improvement over previous fitness programming.”

**NATALIE N.,**  
WEFIT COORDINATER FOR ORANGE COUNTY FIRE AUTHORITY  
AND EXOS FIREFIGHTER MENTORSHIP PARTICIPANT



Identifying these asymmetries through the FMS, I have developed a program and been able to do some corrective exercises that have helped me stay injury free now for many years.”

**STEVE C.**  
FIREFIGHTER AND EMT FOR CENTRAL ARIZONA FIRE AND  
MEDICAL AUTHORITY AND  
EXOS FIREFIGHTER MENTORSHIP PARTICIPANT



EXOS made me realize that if I focus on improving my movement, I can reduce or eliminate pain during activity. Moreover, increasing my range of motion and mobility has improved my performance in all activities.”

**KEVIN O.**  
BATTALION CHIEF AND  
EXOS FIREFIGHTER MENTORSHIP PARTICIPANT



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**WANT EXOS TO HELP TRANSFORM YOUR TEAM?**

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