

While the ability of worksite exercise to prevent low back pain and injury in firefighters requires future research, the results of this study have practical applications for clinicians and researchers who design worksite exercise programs for musculoskeletal injury prevention and treatment.

Back and Core Exercise in Firefighters

Summary of Findings From the FEMA-funded Research Grant at the University of South Florida

By John Mayer, D.C., Ph.D., Lincoln College Endowed Chair, University of South Florida

Introduction

Firefighting is one of the most dangerous, stressful, and physically demanding occupations.¹ Not surprisingly, firefighters are at high risk of musculoskeletal injuries and pain syndromes, particularly of the low back, and low back injury is the most common injury leading to early retirement of firefighters.¹ Previous work found that firefighters with a history of low back pain have poorer back muscular endurance than those without a history of low back pain.²

Various worksite exercise programs have been proposed for firefighters to improve physical

fitness and thereby prevent low back pain and injury, but none have become the gold standard and little research has been conducted on the effectiveness of these programs. In 2011, the research team of the Lincoln College Endowed Chair in Chiropractic and Biomechanical Research at the University of South Florida (USF) was awarded a Fire Prevention & Safety research grant from FEMA to assess a worksite exercise program targeting the back and core muscles in firefighters.

Methods

In the USF study, 96 firefighters from 21 fire stations of Tampa Fire Rescue, FL were randomized to an exercise group (n = 54) or control group (n = 42). In addition to their usual fitness program, the exercise group performed a targeted

back and core exercise program with each session taking approximately 10 minutes to complete, 2X/week for 24 weeks, while on-duty at the fire station. Each exercise session was supervised by a certified peer fitness trainer from the fire department or an exercise physiologist from USF. Each session consisted of one set of progressive resistance back extension exercise performed on a variable angle Roman chair and four core stability exercises performed on a floor mat. The control group performed their usual physical fitness program.

Key Findings

Data collection for the study is finished and some of the key findings include:

- ▶ A targeted back and core exercise training program at the worksite

was efficient, safe, did not disrupt operational flow of the fire department, and did not negatively impact job performance or activities of daily living of the firefighters (3, 4).

- The exercise program was effective at significantly ($p < 0.05$) improving back and core muscular endurance, as measured by the Modified Biering-Sorensen Test and Plank Test, respectively. At 24 weeks, the adjusted back and core muscular endurance scores were 12 percent and 21 percent greater, respectively, for the exercise group compared with the control group.^{3,4}
- Key barriers and facilitators to worksite exercise adherence in firefighters were uncovered. The key barriers were lack of self-motivation (interpersonal), lack of peer support (interpersonal), and lack of time to exercise at work (institutional). The key facilitators were group cohesiveness, competitiveness, interest in exercise, financial incentives, and perceived health benefits.^{4,6}

In addition to these findings, the research team discovered that obesity in firefighters is linked to poor performance on back and core muscular endurance tests,^{7,8} and size of multifidus and transverse abdominis muscles as measured by ultrasound.⁹ These findings lead to the development of two new models to scale lumbar muscular endurance performance and muscle size values to body weight.^{8,9}

Future Research

Future prevention clinical trials and implementation research studies are needed to determine if worksite exercise for the back and core, administered alone or along with other approaches, is an effective countermeasure against occupational low back pain and injuries in firefighters. Moreover, the feasibility of implementing worksite exercise programs for firefighters and other high-risk workers in various settings requires future research. Our group is currently designing research strategies to assess these aims.

Practical Applications

While the ability of worksite exercise to prevent low back pain and injury in



firefighters requires future research, the results of this study have practical applications for clinicians and researchers who design worksite exercise programs for musculoskeletal injury prevention and treatment. Doctors of Chiropractic are frequently involved in designing worksite health promotion programs for firefighters and other high-risk workers. If the goal of such programs is to improve back and core muscular capacity in a safe and efficient manner, then the specific exercise program used in this study is appropriate. This back and core exercise program could be implemented as a stand-alone routine or implemented as part of a global physical fitness routine at the worksite. Furthermore, clinicians and researchers should consider addressing important barriers and facilitators to worksite exercise adherence. Some suggestions to foster exercise adherence include: educating and reminding participants about the benefits of exercise, providing individual and group incentives based on exercise adherence and performance, providing outside monitoring of exercise adherence, varying the exercise routine, allowing opportunities to exercise with a "buddy" or "buddies," facilitating friendly competition, and scheduling exercise at a specific time during each work shift.



References:

- 1) International Association of Fire Fighters (IAFF). *The Fire Service Joint Labor Management Wellness-Fitness Initiative*, 3rd edition. Washington DC: IAFF, 2008.
- 2) Verna J, Mooney V, Stowell C, Parker R, Mayer J. Back

muscle strength, endurance, and flexibility characteristics of firefighters. Proceedings of the 7th Interdisciplinary World Congress on Low Back & Pelvic Pain. 2010:390-4.

3) Mayer J, Quillen W. *Effect of worksite exercise on development of back and core muscular endurance in firefighters. American Occupational Health Conference, American College of Occupational and Environmental Medicine; April 2013; Orlando, FL (accepted for presentation).*

4) Mayer J, Quillen W, Dagenais S. *Effect of worksite exercise on back and core muscular endurance in firefighters. International Society for the Study of the Lumbar Spine Annual Conference; May 2013; Scottsdale, AZ (accepted for presentation).*

5) Mayer J, Nuzzo J, Dagenais S. *Use of participant focus groups to identify barriers and facilitators to worksite exercise therapy adherence in randomized controlled trials involving firefighters. Patient Prefer Adherence. 2013 (accepted for publication).*

6) Libous J, Dagenais S, Quillen W, Mayer J. *Barriers and facilitators to worksite exercise in firefighters. USF Health Research Day; February 2013; Tampa, FL.*

7) Mayer J, Nuzzo J, Chen R, Quillen W, Verna J, Miro R, Dagenais S. *Impact of obesity on back and core muscular endurance in firefighters. J Obes. 2012 729283:1-7.*

8) Nuzzo J, Mayer J. *Body mass normalization for isometric tests of muscle endurance. J Strength Cond Res (accepted for publication).*

9) Nuzzo J, Mayer J. *Body mass normalisation for ultrasound measurements of lumbar multifidus and abdominal muscle size. Man Ther. 2012; <http://dx.doi.org/10.1016/j.math.2012.10.011>.*