

USING E.M.S. TO CONTROL INFLAMMATION AND OPTIMIZE FIREFIGHTER HEALTH

Presented by:

Aaron Zamzow

Lieutenant and Training Officer, Madison Fire Department

Owner- FireRescueFitness.com

Author- Firehouse Magazine, Lexipol, FR1

Host of the Better Every Shift Podcast

FRCE- Fitness and Nutrition Committee Chair



FIRST RESPONDER
Center for Excellence



Aaron Zamzow

- Firefighter and Training Officer for the City of Madison, WI Fire Department. Firefighter/ EMT for over 20 years.
- Certified (NASM, Ace – Peer Fitness, NSCA – CSCS, PN1) and degreed Personal Fitness Trainer with 30 years experience.
- Trained with elite athletes for the NBA, NHL, and NFL.
- Owner of Fire Rescue Fitness
- Contributing Writer for Firehouse Magazine, Firefighter International, Lexipol, FireRescue1...
- Host of the “Better Every Shift Podcast”
- Thank YOU! www.FireRescueFitness.com/seminar



I am not the “Rock.”



FIRST RESPONDER
Center for Excellence

Not Your Normal Health and Wellness Seminar

- No Burpees Required
- No “Bro-tein” Shakes to Drink
- No Bench Press Competitions
- I Got it Wrong for Years.
- Stick with Me (Science)
- All About Improving Health!
- PASS IT ON!



Let me tell you why I suck as a fitness presenter...



I GOT YOU!

Get the slides for the presentation: www.FireRescueFitness.com/seminar

Sign up for a FREE FRF 28-day Catalyst Workout Program and Eating Guidelines.



What Do We Want to Learn.

- **What are the Health Issues We Face?**
- **Biomarkers of Effect and Research.**
- **What is Inflammation and Why should you care.**
- **What Causes Inflammation.**
- **What is Resilience.**
- **E.M.S. = The "best" steps to building resilience**
- **Q and A**
- **PLEASE ASK QUESTIONS!**

What are the health issues facing first responders?

- Heart attacks and strokes
- Cancer
- Obesity, diabetes
- Low T (low testosterone)
- Sleep apnea
- PTSD
- Mental Health
- Depression
- Musculoskeletal Injury **
- Suicide



BASED ON U.S. CANCER RATES

- ➔ GREATER NUMBER OF FIREFIGHTER CANCER DIAGNOSIS & CANCER-RELATED DEATHS
- ➔ TWICE AS MANY FIREFIGHTERS WITH MALIGNANT MESOTHELIOMA, CAUSED BY EXPOSURE TO ASBESTOS
- ➔ INCREASED CASES OF CERTAIN CANCERS AMONG YOUNG FIREFIGHTERS

IN COMPARISON TO OTHER FIREFIGHTERS

- ➔ CHANGE OF LUNG CANCER DIAGNOSIS OR DEATH INCREASES WITH AMOUNT OF TIME SPENT AT FIRES
- ➔ CHANCE OF LEUKEMIA DEATH INCREASES WITH NUMBER OF FIRE RUNS

*BASED ON NIOSH FINDINGS
<https://www.cdc.gov/niosh/pgms/worknetty/pdfs/ff-cancer-factsheet-final-508.pdf>

What are Biomarkers of Effect

Biomarkers of effect are measurable changes in biological systems or samples that indicate an interaction between a biological system and a potential hazard, which may lead to a health effect.

Common means of testing in firefighter research: Blood, urine, saliva, skin, exhaled breath condensate, and sputum.

Measuring Biomarkers

These biomarkers give us insights into the potential health risk of exposure to environmental, physiological, or psychological stressors and allow us to understand and quantify the effects of these exposures.

- **Oxidative Stress:** This is an imbalance between free radicals and antioxidants in your body. Biomarkers for oxidative stress include substances like malondialdehyde (MDA), 8-Hydroxy-2'-deoxyguanosine (8-OHdG), or nitric oxide (NO). These chemicals are produced when oxidative stress damages cells.
- **DNA and Protein Damage:** This refers to genetic materials or proteins in cells becoming damaged as a result of exposure to toxins, radiation, or other stressors. Biomarkers for such damage involve comet assay, micronuclei test, and measurements of protein carbonyls and other products of oxidative damage.
- **Stress Hormones:** These are hormones released by the body in response to stressful situations. Examples include cortisol, adrenaline (also known as epinephrine), and norepinephrine.
- **Inflammation:** This is your body's protective response to injury or infection. Pro-inflammatory cytokines like CRP, IL-6, TNF- α , are often used as biomarkers for inflammation.
- **Vascular Injury:** An injury to blood vessels can disrupt circulation and lead to numerous health problems. Biomarkers for vascular injury include von Willebrand factor, soluble intercellular adhesion molecule-1, and other substances linked with endothelial dysfunction or damage.
- **Lung Injury:** This refers to damage caused to the lungs by harmful particles, gases, or infections. Biomarkers for lung injury can include Clara Cell Protein (CC16), surfactant protein-D (SP-D), or BAL neutrophils.

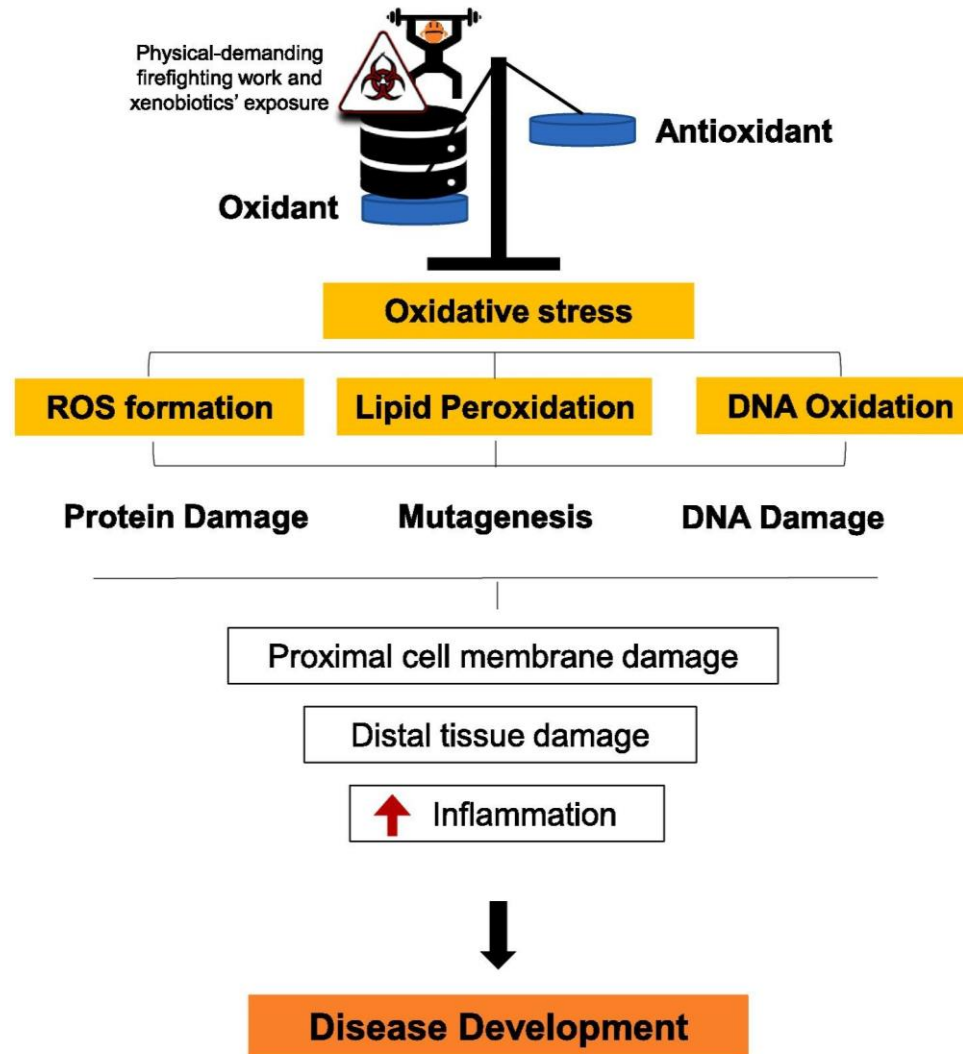
What does the Research Show

- Prolonged exposure to health-relevant pollutants released from fires promotes the continuous formation of reactive oxygen species (ROS), unbalances the oxidative/antioxidant activity, and DNA damage.
- Physical-demanding activities conducted using PPE and heat exposure show oxidative stress.
- Fear and anxiety of the job have been linked with enhanced secretion of specific stress hormones.

What does the Research show (continued)

- **Chronic sleep restriction creates changes in cortisol secretion and/or adverse effects on glucose metabolism.**
 - Sleep deprivation interferes with the brain's cleaning system known as the glymphatic system.
- **Poor dietary habits can lead to a multitude of health issues and are often reflected in certain biomarkers of inflammation.**
- **Lack of exercise (inactivity) is linked to a litany of health issues and to various biomarkers (LDL, blood glucose, C-reactive protein, etc.)**

What Does it Mean?



Reactive oxygen species (ROS) are oxygen-containing radicals that are capable of independent existence with one or more unpaired electrons.

What is Inflammation?

- Inflammation refers to your body's process of fighting against things that harm it, such as infections, injuries, and toxins (poor nutrition), and STRESS.
- Cortisol is produced to regulate the inflammatory and immune response
- Prolonged stress leads to hyper-physiological levels of cortisol and alters its effectiveness.
- The chronic state of inflammation can lead to a decrease in performance and numerous health problems, including heart disease, arthritis, depression, Alzheimer's disease, PTSD and even cancer (Segerstrom, 2006).

Responses to “Unmanaged” Inflammation (Stress)

- Physical responses may include”
 - Fatigue
 - Extreme exhaustion
 - Headaches
 - Heartburn
 - Difficulty sleeping and nightmares
 - Digestion issues
 - Increased inflammation and joint pain
- Emotional and mental responses include:
 - Confusion
 - Anxiety
 - Depression
 - Anger and outrage
 - Feelings of helplessness
 - Substance Abuse

“Our minds think we respond one way, and our physiology says something different.”

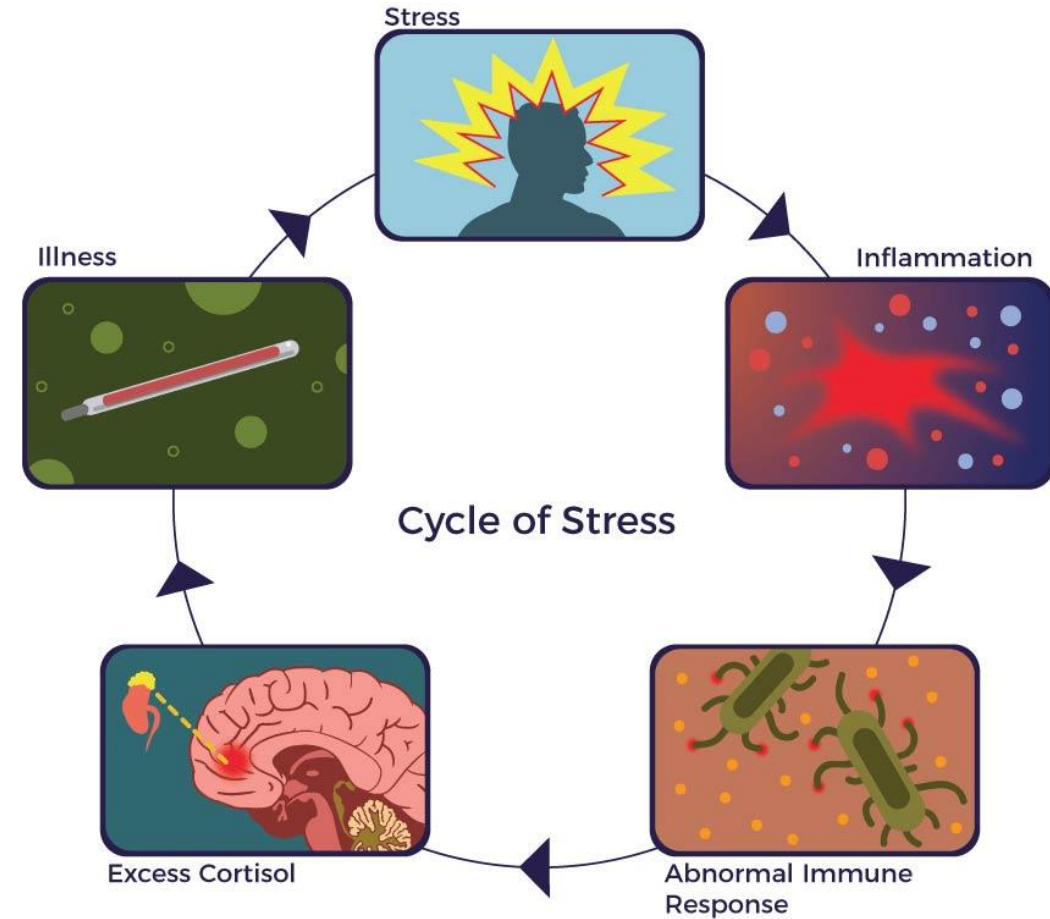
–Dr. Kyle Ebersole (UW Milwaukee Study on the Physiological of Emergency Response)



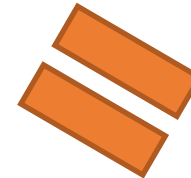
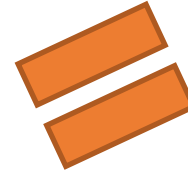
“The expectation that we can be immersed in suffering and loss and not be touched by it is as unrealistic as expecting to be able to walk though water without getting wet.”

-Captain Frank Leto - FDNY

- Heart attacks and strokes
 - Cancer
- High Blood Pressure
 - Substance abuse
 - Obesity, diabetes
- Low T (low testosterone)
 - Sleep apnea
 - PTSD
 - Mental Health
 - Depression
- Musculoskeletal Injury
 - Suicide
- Digestive issues
- Memory loss
- Relationship Issue



Uncontrolled Inflammation



THE REALITY!!!

- Oxidative stress can be reduced by approaching a balanced lifestyle. Nutrition, an active lifestyle and adequate sleep are the best treatments against oxidative stress and controlling inflammation.
- The modern lifestyle associated with an unhealthy diet, lack of physical exercise, exposure to a combination of chemicals from different sources, heavy metals, food additives, and environmental pollution can influence the appearance of oxidative stress and disease.
- Health status depends on multiple genetic and non-genetic factors. Nonheritable factors (such as lifestyle and environmental factors) have stronger impact on immune responses than genetic factors.





- Drugs
- Alcohol
- Social Media
 - Eating
- Avoidance
- Focus on everyone else!
- WE DON'T?

How do we cope?

I used to work in a fire hydrant factory. You couldn't park anywhere near the place.

Compliments of Comedian Steven Wright



www.FireRescueFitness.com

Sound Familiar?

“I will sleep when I am dead.”

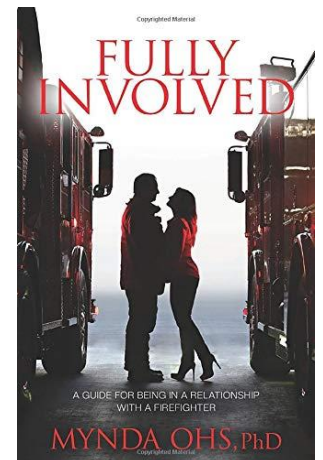
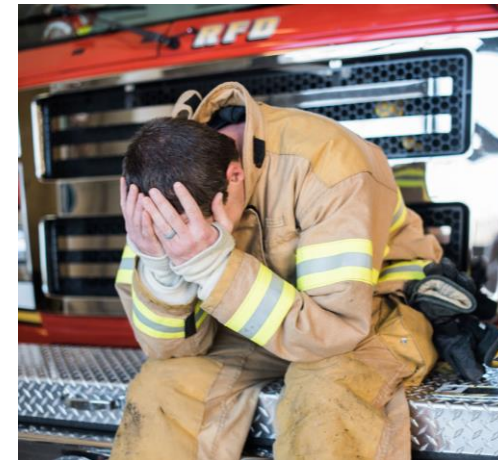
“I can’t workout because I need to work my other jobs to support my family.”

“Counseling is for the weak.”

“I only had a little bite...”

“It doesn’t affect my relationship.”

Yes it does- Fully Involved by Dr. Ohs



Are YOU Dangerous To Your Crew?

- Don't exercise regularly.
- Don't train functionally.
- Eat a high-sugar, unhealthy diet.
- Don't get enough sleep.
- Don't see counselors.
- Don't get annual medicals.
- Don't wear SCBA
- Don't clean your gear



**Is this a good brother/
sister of the fire service?**

Ponder this...

“Your _____ is like an injury on the fire/rescue scene.”

Fill-in the blank:

- Lack of fitness**
- Health issues**
- Poor nutrition**
- Lack of sleep**
- ...**

START HERE!

**TAKE CARE OF YOURSELF,
SO YOU CAN TAKE CARE OF THEM.**



www.FireRescueFitness.com

resilience

"The behaviors, thoughts, and actions that promote personal wellbeing and mental health. It refers to "a person's ability to withstand, adapt to, and recover from adversity and stressful situations. "



“ A resilient first responder uses effective coping strategies to adapt well in the face of adversity, trauma, tragedy, threats, or significant sources of stress. They miss fewer days of work; can provide more compassion to those they service and have greater job satisfaction and career longevity.

The three best coping strategies every first responder has at their disposal to improve resilience are fitness, nutrition, and mental “self-care.”

”

- ZAM (FRF)



**AND
SLEEP!**

What does it mean to be healthy?

- **Fit or not fit: Shredded, works out 2 times per day, drinks 2 energy drinks per day, and needs alcohol to sleep...**
- **Fit or not fit: Workout 3 times per week, 10-15 pounds overweight, eats healthy, practices mindfulness...**

Health is a confluence of factors that work together.



Improve Performance and Resilience



E

= Exercise (functionally)



M

= MIND YOUR NUTRITION



S

= SLEEP

How to Control Stress/ Inflammation- Functional Fitness.

One moderate exercise session has a cellular response that may help suppress inflammation in the body.**

- Injury Reduction/Performance Improvement
 - Weight control
 - Lower instances of Cancer
- Decrease chances of sudden heart attack and stroke.
 - Improves cognitive thinking
- Improves mental health (lowers symptoms of depression)
 - Helps manage PTSD
 - Improves Cognitive Thinking
- Improves immune response (COVID)

[** Brain, Behavior, and Immunity](#)
[Volume 61](#), March 2017, Pages 60-68

Nutrition and Inflammation (the good news).

- Research shows that one of the best ways to reduce inflammation lies not in the medicine cabinet, but in the refrigerator...



DEEP THOUGHTS...

Every time you eat or drink
in the firehouse, you are
either feeding disease or
fighting it...



BOOM!

Sleep and Inflammation (the good news).

- Sleeping seven to eight hours can help prevent and reduce inflammation and disease.
- **WIN, WIN, WIN**
 - Exercise can help you sleep, sleep can help you perform, and vise-versa.
 - Sleep can help deal with trauma.
 - Sleep can combat cravings.



TAKE ACTION!



“

**MOTIVATION IS WHAT
GETS YOU STARTED...
HABIT IS WHAT GETS
YOU RESULTS.”**

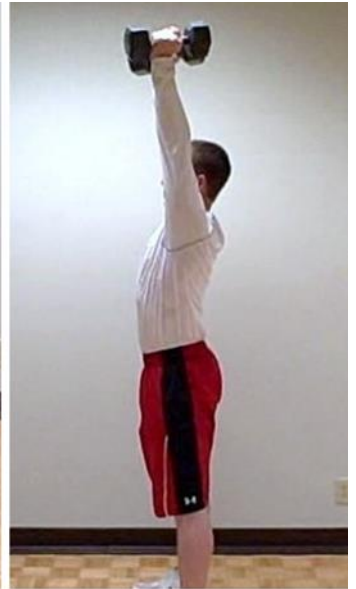
-ZAM

Improve Performance and Resilience (the Application)



• EXERCISE (Functionally)

- At least 3x/ week for 30-45 minutes
 - Mobility exercises (at least 5 minutes)
 - Stretch and foam roll
 - Include full-body strength exercises
 - Include core movements -plank
 - Cardiovascular exercise
 - Long slow cardio
 - Intervals



Squat to Press



THIS IS “Functional”...

The main goal of a firefighter, EMT and/or medics workout should be to improve performance (fire/rescue ground movements), reduce injuries, and promote career longevity.

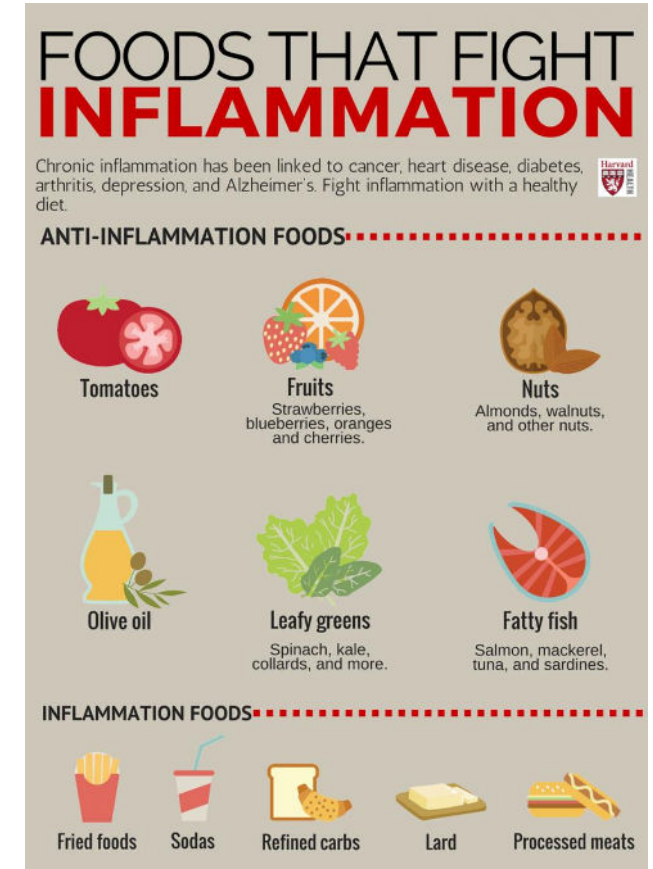
Essential Components of a Firefighter Workout.

- 1. Have a Plan**
- 2. You MUST work your Core**
- 3. Have Some Heart- Intervals**
- 4. Be Full-body Functional**
- 5. Warm-up and Be Flexible (foam rolle**
- 6. Understand RECOVERY**



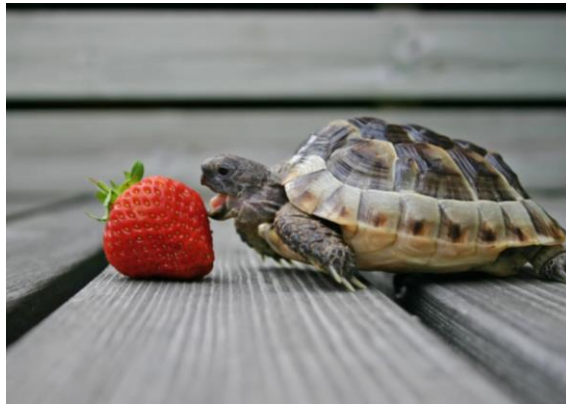
Improve Performance and Resilience (the Application)

- **MIND YOUR NUTRITION**
 - Drink at least 80 ounces of water a day!
 - Eat real food
 - Limit sugar and processed “junk” food
 - Eat your fruits and veggies
 - Your Mom was right!
 - Have some healthy fats
 - Focus on healthy fats (nuts, olive oil, avocado)



Improve Performance and Resilience (the Application)

- **MIND YOUR NUTRITION**
 - Use the 10-minute rule for eating.
 - Take at least 10 minutes to eat each meal.
 - Wait 10 minutes before going for any second helping.



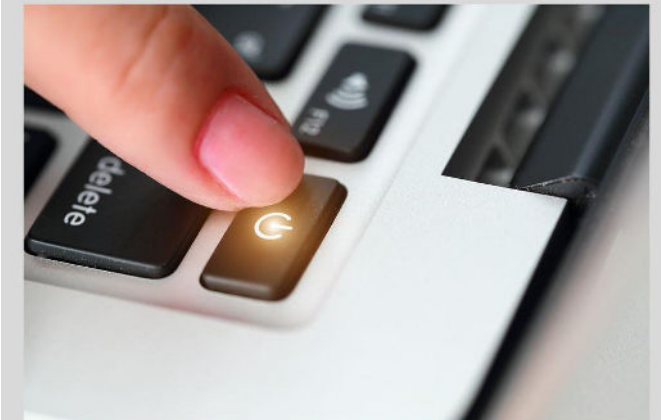
EAT SLOWLY



**IT TAKES YOUR BODY 20 MINUTE
TO REALIZE IT'S FULL.**

Improve Performance and Resilience (the Application)

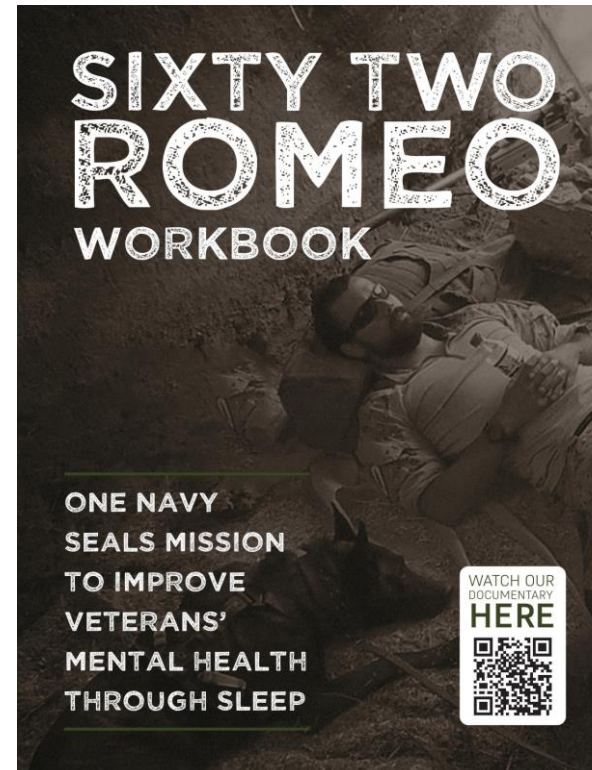
- **SLEEP!**
 - Aim for 7-9 hours (as often as possible).
 - Hit the rack at the same time each night.
 - Create a “Sleep Fortress”
 - Dark, cool, and quiet
 - Power down at least 30-minutes before bed
 - Blue light from cell phones, computer screens, and LED and florescent lighting can block production of sleep hormones.



Power down before napping and sleeping.

Improve Performance and Resilience (the Application)

- **SLEEP!**
 - Nap when needed.
 - Try a “Coffee Nap”
 - Deep Breathing for Stress Relief
 - Physiological sigh (out more than in)
 - Sleep Education- It is a skill and takes work
 - Sixty Two Romeo



Improve Performance and Resilience (The Plan)

Optimizing the fire Ground						
Sunday (on shift)	Monday	Tuesday	Wednesday (on shift)	Thursday	Friday	Saturday (on shift)
30-minute walk	Full-body Strength Workout	Light jog, bike or walk with 10 minutes of stretching/ yoga	Crew Interval Workout (slams, crawls, stairs, plank, carry, drag)	Light jog, bike or walk with 10 minutes of stretching/ yoga	Full-body Strength Workout + 10 minutes of intervals	30-minute walk
5 +1 = 6 Breathing	Coffee Nap		5 +1 = 6 Breathing			5 +1 = 6 Breathing
Bed at 10	Bed at 10	Bed at 10	Bed at 10	Bed at 10	Bed at 10	Bed at 10

Daily Nutrition Goals

- At least 80 ounces of water
- Limit Sugars (added sugars 40 grams or less)
- Eat lean protein, veggies and fruit at each meal (4x/ day)
- Have some healthy fats (almonds, avocado)

It is Not Easy...

LOOK IN THE
MIRROR....
THAT'S YOUR
COMPETITION.



www.FireRescueFitness.com

EVERY DAY IS
ANOTHER CHANCE
TO GET STRONGER
TO EAT BETTER
TO LIVE HEALTHIER
AND TO BE THE
BEST VERSION OF YOU



www.FIRERESCUEFITNESS.COM

DO NOT GIVE
YOUR PAST
THE POWER TO
DEFINE YOUR
FUTURE

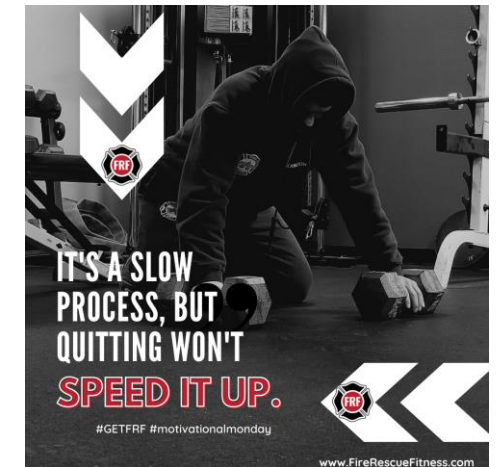


GET FIT FOR DUTY, GET FIT FOR LIFE

www.FireRescueFitness.com



"Be impatient with your actions...
Be patient with your RESULTS."



IT'S A SLOW
PROCESS, BUT
QUITTING WON'T
SPEED IT UP.

#GETFRF #motivationalmonday



www.FireRescueFitness.com



Josh Murdock

Has lost over 100 pounds with the help of FRF. And, he continues to make progress and motivate others. Congrats Josh!



Jimmy Fannin Jr.

I fell in love with the FRF in 2018 and have used the programs for three years. They have helped me lose over 70 pounds and counting. The workouts are effective, fun, and efficient and will keep you motivated and making progress. I highly recommend it. Thank You Zam and FRF for all you do!



Lisa Charbonneau

Lisa the FRF Ultimate Fire Athlete Workout to lose body fat and gain functional muscle. She can feel the difference in her added strength and stamina both on and off the fire ground. Congrats LISA, YOU ARE FRF!

REALITY



Cynthia Niznik

"FRF has been an amazing program with functional fitness that has directly impacted my abilities on the fireground. As a female firefighter, this has been a game-changer for me, and I feel more confident in my physical abilities. Thanks for the butt-kicking, sweat-pouring workouts!"



Josh Fulk

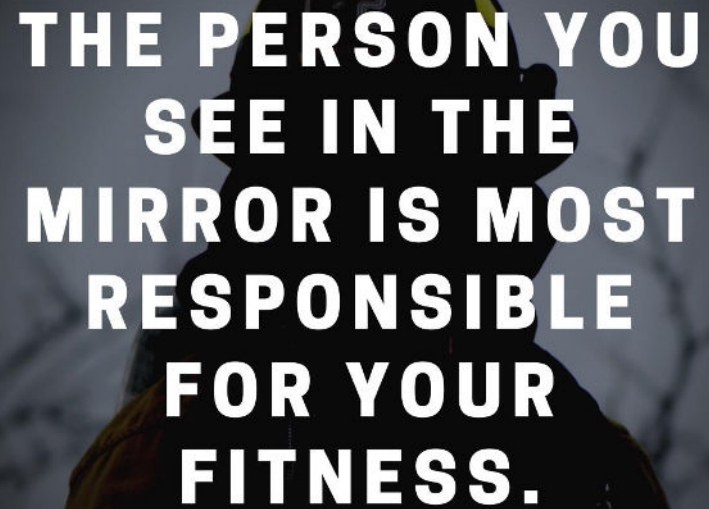
Josh has lost over 100 pounds following the FRF workouts and eating guidelines. He continues to make progress in his weight loss and performance improvement on (and off) the fireground. Way to go Josh! Looking forward to posting your continued progress..



Brian DiLeggi

Lost over 40 pounds and added strength and muscle. He is feeling better than ever and notices a huge improvement in his performance on and off the fireground and in his energy through the day. He continues to use FRF workouts to add muscle and eat healthy to lose body fat. Congrats Brian you are FRF!

WHAT ARE YOU GOING TO DO TO BE BETTER?



**THE PERSON YOU
SEE IN THE
MIRROR IS MOST
RESPONSIBLE
FOR YOUR
FITNESS.**



**“ONE OF THE BEST
FORMS OF PEER
SUPPORT IS
ENCOURAGING A
HEALTHY CULTURE.”**

Are you in?

RESILIENT 50

**SELECT 7 OF THE 10 HABITS BELOW.
DO THEM, EVERY DAY FOR 50 DAYS.
IF YOU MISS ONE, START OVER AT DAY 1.**

- 30 MINUTES OF EXERCISE
- 8500 STEPS
- 80 OUNCES OF WATER
- NO CHEAT DAYS/ NO ALCOHOL
- FOLLOW A DIET/ HEALTHY EATING PLAN
- 10 MINUTES OF READING (NON-FICTION)
- 1 MINUTE OF DEEP BREATHING
- POWER DOWN 30 MINUTES BEFORE BED
- BED AT THE SAME TIME EVERY DAY
- +1 YOUR CHOICE HABIT DEVELOPMENT

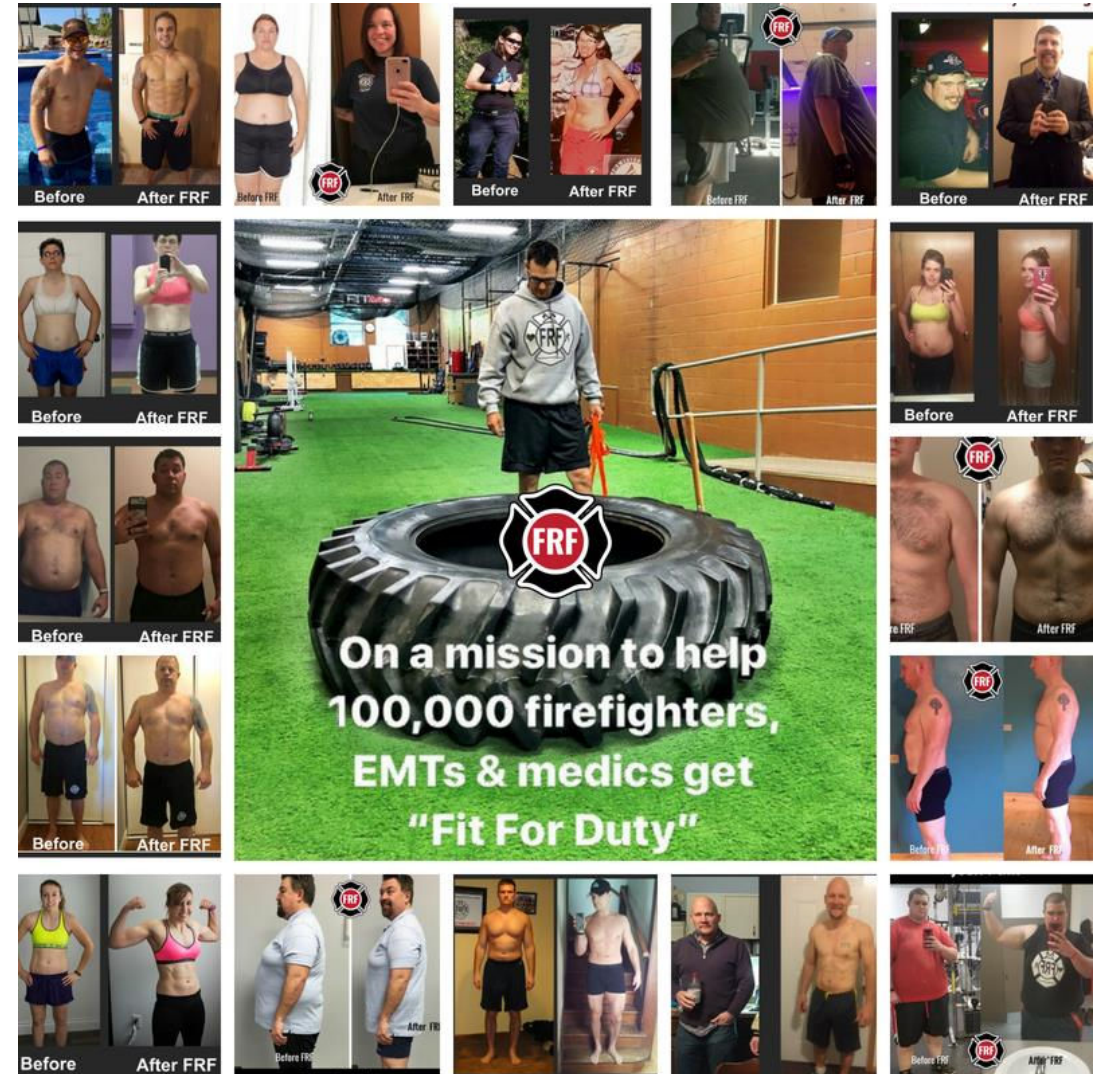
COMPLETE 50 DAYS AND GET A SPECIAL CHALLENGE COIN



**Do something every day/shift
to improve your health!**

Thank You for Attending

**Please visit:
www.firerescuefitness.com/seminar**



More Research!

- What habits have the most positive outcome on biomarkers?
- How does sleep, exercise, body composition combat toxin exposures?
- How can we better use technology to diagnose health trends?
- Wearable technology for the fire service?
- Can donating plasma or blood reduce PFAS in our system?
- Comparison studies of healthy vs. unhealthy subjects on performance and biomarkers following responses?
- Researchers from several fields of study (environment, toxicology, (bio)chemistry, occupational medicine, *etc.*) and firefighting associations as well as regulatory agencies should join efforts and (human and financial) resources.

Additional Slides for Q and A **and references.**

Q and A

- When to Workout?
- Assessments?
- Best Exercises?
- Snack Options?
- Best “functional” equipment?
- How to stay motivated?



The Anatomy of a Functional Workout

- Active warm-up (3-4 exercises)
- Core Training and prehab (3-4 exercises)
- Strength Training (8 exercises)
- Interval Overhauls (5 movements)
 - Use an interval timer
- Stretch and foam roll (5 minutes)



(Functional) Fitness and Inflammation

- A lack of exercise leads to hormone imbalances, weight gain, increased body fat (which contains inflammation-promoting substances).
- Improper training can lead to injury and a lack of mobility.



Nutrition and Inflammation (the bad news).

- Diets that promote inflammation are high in refined starches, sugar, saturated and trans-fats, and low in omega-3 fatty acids, low in fiber, low in fruits and vegetables... (sound familiar)?
- Eating toxins cause an inflammatory response in the body.



Sleep and Inflammation (the bad news).

- Poor sleep is associated with higher levels of inflammatory biomarkers.
- When you don't get enough sleep blood pressure can't decline and triggers the cells in blood vessel walls to activate inflammation.
- Sleep deprivation interferes with the brain's cleaning system known as the glymphatic system.



Dzierzewski JM, Donovan EK, Kay DB, Sannes TS, Bradbrook KE. Sleep Inconsistency and Markers of Inflammation. *Front Neurol.* 2020 Sep 16;11:1042. doi: 10.3389/fneur.2020.01042. PMID: 33041983; PMCID: PMC7525126.

TOP 10 THINGS FIT FIREFIGHTERS DO

- 1. Train functionally at least 3-4 times per week (consistently).**
- 2. Hydrate- with water. Watch alcohol and energy drinks.**
- 3. Get your annual medicals and cancer screens. And assess your level of fitness regularly.**
- 4. Eat according to your goals. Eat real foods and lots of fruits and vegetables.**
- 5. Focus on sleep (value sleep).**
- 6. Manage your weight and body fat percentage.**
- 7. Clean gear 2x per year and after incidents (including helmet liner and hood).**
- 8. Work on your Emotional Resilience (build resilience). Connect with people!**
- 9. Wear SCBA during all fires including overhaul and dumpster/ auto fires.**
- 10. Get Better Every Shift- Practice an attitude of gratitude and focus on making yourself and those around you inspired to improve health, knowledge, and impact.**



Sources

- Anil Kumar, N. V., Zucca, P., Varoni, E. M., Dini, L., Panzarini, E., Rajkovic, J., Tsouh Fokou, P. V., Azzini, E., Peluso, I., Prakash Mishra, A., Nigam, M., El Rayess, Y., Beyrouthy, M. E., Polito, L., Iriti, M., Martins, N., Martorell, M., Docea, A. O., Setzer, W. N., . . . Cho, W. C. (2020). Lifestyle, Oxidative Stress, and Antioxidants: Back and Forth in the Pathophysiology of Chronic Diseases. *Frontiers in Physiology*, 11, 552535. <https://doi.org/10.3389/fphys.2020.00694>
- Barros, B., Oliveira, M., & Morais, S. (2021). Firefighters' occupational exposure: Contribution from biomarkers of effect to assess health risks. *Environment International*, 156, 106704. <https://doi.org/10.1016/j.envint.2021.106704>
- Giugliano D, Ceriello A, Esposito K. The effects of diet on inflammation - Emphasis on the metabolic syndrome. *J Am Coll Cardiol*. 2006;48:677–85.
- Orysiak, J., Młynarczyk, M., Piec, R., & Jakubiak, A. (2022). Lifestyle and environmental factors may induce airway and systemic inflammation in firefighters. *Environmental science and pollution research international*, 29(49), 73741–73768. <https://doi.org/10.1007/s11356-022-22479-x>
- Pahwa R, Goyal A, Bansal P, Jialal I. Chronic Inflammation (<https://www.ncbi.nlm.nih.gov/books/NBK493173/>). Treasure Island (FL): StatPearls Publishing; 2021 Jan-.
- Smith, D. L., Friedman, N. M. G., Bloom, S. I., Armero, W. L., Pence, B. D., Cook, M. D., Fernhall, B., Horn, G. P., & Woods, J. (2019). Firefighting Induces Acute Inflammatory Responses that are not Relieved by Aspirin in Older Firefighters. *Journal of occupational and environmental medicine*, 61(7), 617–622. <https://doi.org/10.1097/JOM.0000000000001626>
- Sureda A, Bibiloni MDM, Julibert A, et al. Adherence to the Mediterranean Diet and Inflammatory Markers (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5793290/>). *Nutrients*. 2018;10(1):62

**PLEASE REACH OUT TO ZAM WITH ANY
QUESTIONS.**

Zam@firerescuefitness.com

www.FireRescueFitness.com/seminar



FIRST RESPONDER
Center for Excellence