



2022
NSCA **TACTICAL ANNUAL TRAINING** **#NSCATactical22**

CONFLICT OF INTEREST STATEMENT

I have no actual or potential conflict of interest in relation to this presentation.

Jim McDonald

- Husband and father of 2
- Firefighter 7 years
- B.S. in Exercise Sport Science (Iowa State University)
- Certifications (NSCA)
 - CSCS
 - NSCA-CPT
 - TSAC-F

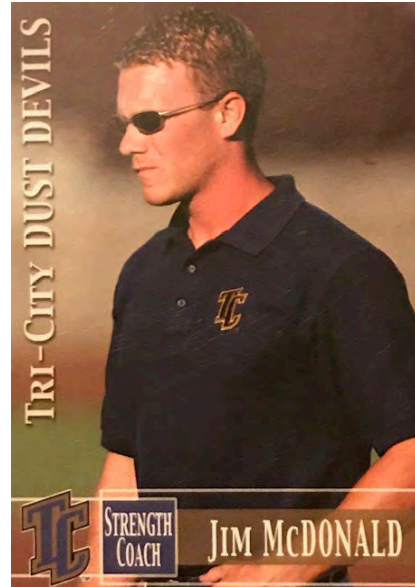
19 years' experience

Collegiate Division 1 Sports & Football

Professional Sports (MLB, NFL)

Private/Corporate Sector

Tactical – Last 7 years



Agenda

- Statistics in the fire service
- Challenges in the tactical population
- Cardiovascular health
- Nutrition's role
- Strength training
- Wrap up

Overview of the fire service

- Leading cause of line of duty deaths (LODD) is sudden cardiac death (7,15)
 - 45-50% each year with the average around 23 deaths per year
 - 45% or approx. 10 of these deaths were due to firefighting activities and overexertion as the primary cause (7,19)
- 73-88% of firefighters are overweight or obese(28)
- Durand and Collogues indicate 37% of firefighters did not meet recommendations (20)
- Comorbidities
 - High blood pressure, high cholesterol, diabetes, left ventricular hypertrophy

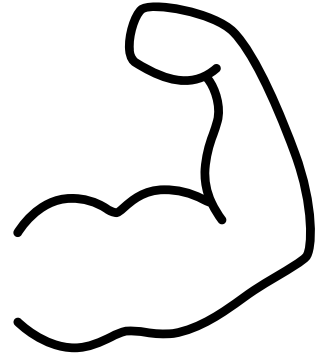
Overview of the fire service

- Silent killer of the fire service & tactical
 - Sleep deprivation - effects hormones, circadian rhythm just for starters
- Endocrine system
 - Constant sympathetic nervous system (CNS) activation
 - Fight or flight
 - Nighttime calls - EMS/Fire
 - Adrenaline
 - Cortisol

Challenges in the tactical arena



General
Population
with
specialized job
that adds
compounding
issues



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						



Health Related Standards from the National Fire Protection Association (NFPA)

- No federal standards or guidelines
- Oxygen demand required of fire suppression can range from 18-44 ml/kg/min with a mean VO₂ of 41.5 ml/kg/min (21)
- NFPA 1582: Standard on Comprehensive Occupational Medical Programs for Fire Departments (9)
 - Minimum of 12 METS (42 ml/kg/min) is recommendation for the Fire Service (9)
 - Anything less than 12 METS is considered a medical condition (9)

Metabolic Cost Research

(8) Langford et.al (2021).

Fires are statistically 3% of the job (15)
1% real deal fires and working hard (15)

We are training for the minority and not the majority of the job

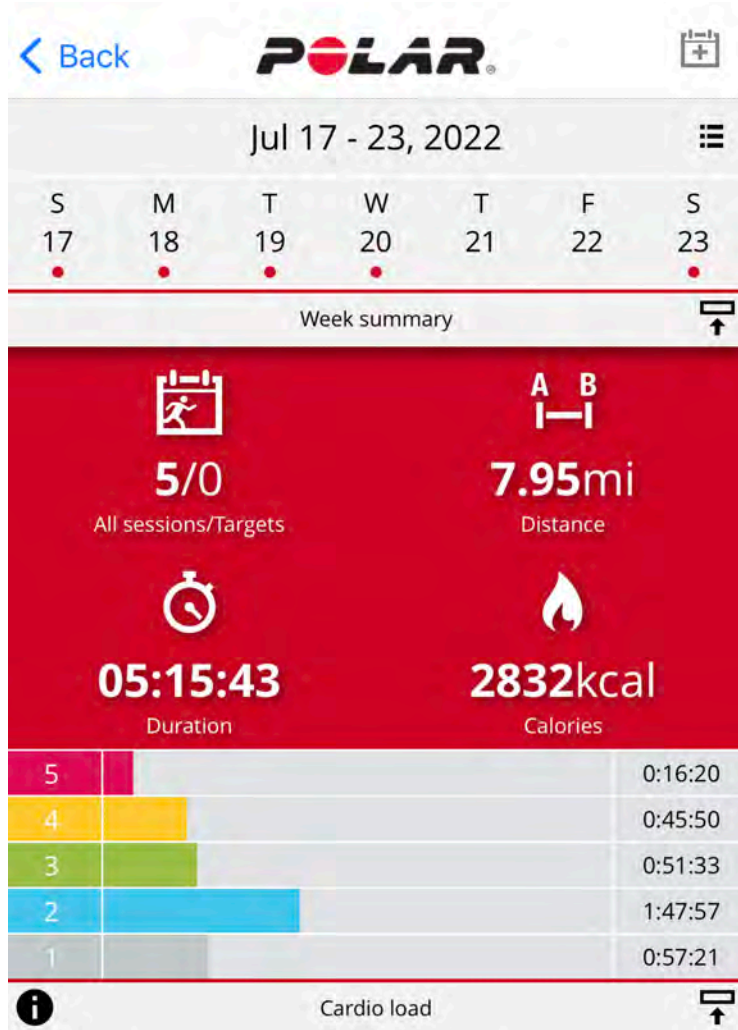
My challenge to us and the industry is to educate and train differently

Reality of Tactical Training

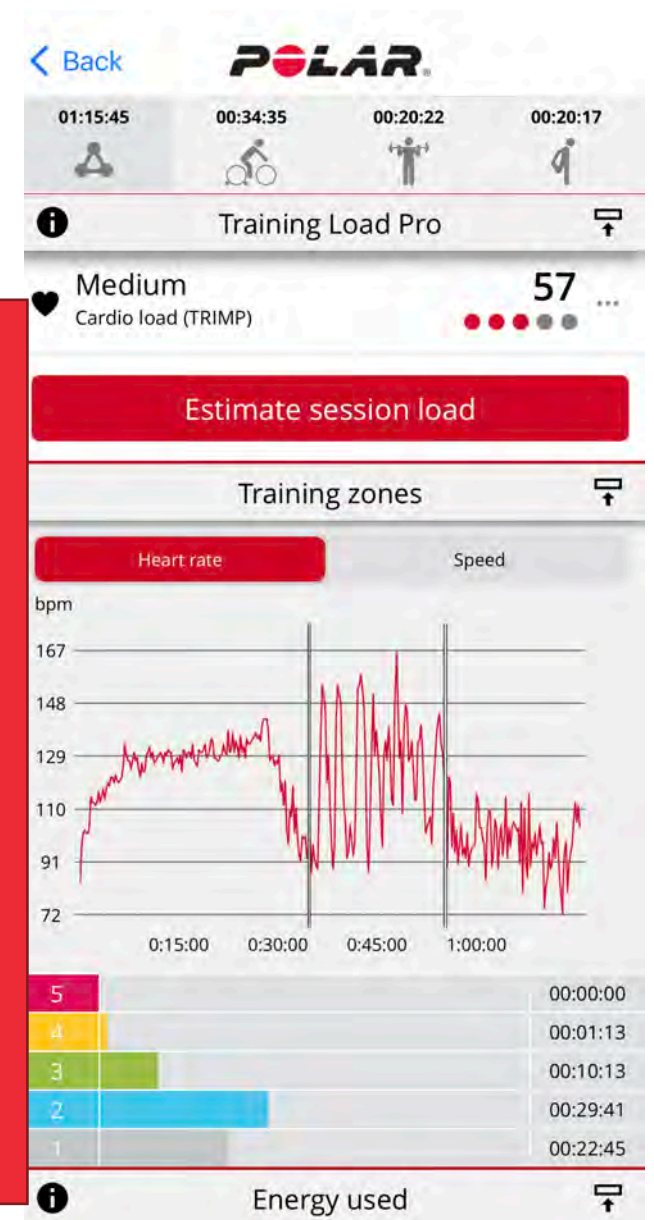
Train tactical athletes for actual occupational demands and health benefits

- **Fire**
 - EMS is 70% of avg call volume in United States (15)
 - Low intensity, high strength component
- **Police**
 - Patrolling, routine traffic stops and public assists
 - Low intensity, sedentary in patrol cars throughout day
- **Military**
 - Classroom training and tactical briefings
 - Physical training and occupational/operational training
- All have a good amount of time spent being sedentary
 - Going from 0 to 60 mph

Cardiovascular Training



- Train using all energy systems and your full HR zone ranges.
- Train for heart health and occupational performance (Zone 2/MAF).
- General guidelines recommend achieving five or more days per week of moderate-intensity (30 – 60 min), three or more days per week of vigorous-intensity exercise (20 – 60 min), or a combination of both moderate- and vigorous-intensity exercise 3 – 5 days per week (3)



Occupational Training

No zone 2 training

Strength
Training

Flexibility, mobility etc.

Work specific Training
(mimics job tasks)

CrossFit, Circuits, HIIT
(High heart rate zone)

CrossFit, Circuits, HIIT

Flexibility, mobility,
myofascial release, yoga

Work specific Training (mimics job tasks)
On the job training with your crew

Zone 2(MAF), Cardiovascular benefits and the
base to be able to perform vigorous exercise and
recover

Strength training

Occupational Fitness Vs. Performance

- Occupational or aerobic fitness is represented by fitness assessments for cardiovascular efficiency (I.e. VO2, Cooper test, mile)
- Occupational performance is tested by performing simulated job skills such as ladder raise, hose drag (I.e. CPAT, IPAT, Combat challenge)
- These measure different things and can be used in conjunction but not interchangeably
- Occupational fitness gives you the aerobic capacity to perform the job tasks (occupational performance) required and recover from it.

Prevention & Nutrition: A Key to Cardiovascular Health

- Nutrition is the answer to the global issue with heart disease
 - #1 killer globally, #1 in tactical and #1 in the United States 23.1% (27)
- Cannot outwork a poor diet
- Need to put premium fuel in your tank to get the best performance
 - You are what you eat
 - What you input equals the output
- Full blood work panels- looking at inflammatory markers & cholesterol
 - Cleveland Clinic and Mayo clinic suggest the Mediterranean diet to help reduce heart disease and lower inflammatory markers. Might be a good lifestyle for tactical population.

Nutrition Basics- How to beat the issue

- Lots of vegetables- The more color the better
- Control portion sizes
- Eat whole grains
- Lean protein choices
 - Limit red meat
- Limit added sugar
 - Fresh fruit
- Reduce or restrict salt intake
- Healthy fats- variety of nuts, avocado, fish, olive/avocado oil
- Hydration, Hydration, Hydration
- **Meal Prep- meals and snacks**

Strength Training

- Large impact for injury reduction and cost savings in tactical field
- Keep it simple
 - Linear/undulating/conjugate periodization
 - Programming for power, strength, hypertrophy & endurance
- Classic lifts- Squats, deadlifts, bench press
 - Push, pull, drag or carry
- Accessory- Shoulder, rotator cuff and core
- Reality of the job
 - Low back injuries, getting off rigs (deceleration), lifting from or in awkward positions
 - Weak people get hurt more frequently and often than a stronger person

OUR STRENGTH SERVES

Strength Serves

5600 ml/kg/min = 56 or 16 METS

99.5kg

5600 ml/kg/min = 33.93 or 9.69 METS

165kg

Need to be strong and in good cardiovascular condition to combat the effects of the gear.

Basic Uniform
219 Pounds

Shirt

BDU Pant

Boot

Bunker Gear
280 pounds

Helmet

Breathing Apparatus

Flashlight

Thermal Imaging Camera

Hand Tools

Bunker Gear

Boots

Irons
301 pounds

Breathing Apparatus

Flashlight

Thermal Imaging Camera

Irons

Bunker Gear

Boots

Helmet

Hand Tools

High-rise Gear
363 pounds

Breathing Apparatus

Flashlight

Thermal Imaging Camera

Irons

Bunker Gear

Boots

Helmet

High-rise Pack

Hand Tools

Strength Training

- Imperfect movement- Awkward positions of lifting on the job
 - Train in different positions, planes, angles etc.
 - Single leg, unilateral
 - Uneven loading
- Strength will build tissue tolerance
 - If you are not used to lifting heavy, there is a higher rate of injury

Example Workout Template

- 48/96 schedule

Work day 1- Rest-stretch, yoga, meditate

Work day 2 – Zone 2 cardio, light lower body strength and stretch

Day 1- **Zone 2 cardio**, strength upper body and stretch

Day 2- Interval Training, core and stretch

Day 3- Rest

Day 4- Whole body circuit and stretch

Wrap Up

- Appropriate cardiovascular programming
 - Focus on zone 2 lower HR zones to build the aerobic base
 - Supplement circuits, HIIT, job task specific work
- Proper Nutrition
- Strength Training
 - Injury prevention and relates to the majority of the job
 - Uneven loading, single leg, awkward positions

Special thanks to Dr. Mark Abel, Dr. Jay Dawes, and John Hofman

A combination of aerobic and strength training with full body strength and power training will yield the best results (29)

- The goal is to help operators be resilient and have a long healthy career
- Have a healthy retirement and be able to enjoy it
- Longevity is the real goal and focus as S&C professional in tactical

References

1. Abel, MG, Palmer, TG, and Trubee, N. Exercise program design for structural firefighters. *Strength and Conditioning Journal* 37(4): 8-19, 2015.
2. Loewen, B, Melton, B, Ryan, G and Snarr, R. Evidence-based exercise for structural firefighters. *TSAC Report* 57(1):4-9, 2019.
3. Riebe, D, Ehrman, JK, Liguori, G, Magal, M, and American College of Sports Medicine. General Principals of exercise prescription. In: *ACSM's Guidelines for Exercise Testing and Prescription*. Wolters Kluwer; 143-179, 2018.
4. Campbell, R, Evarts, B, and Molis, JL. United State Firefighters injury report 2018. Quincy, MA: NFPA Research, Data, and Analytics Division, 2019.
5. Fahy, RF, and Molis, JL. Firefighter Fatalities in the United States-2018. Quincy, MA: NFPA Research, Data, and Analytics Division; 2019.
6. Mathers CD, Loncar D Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 3: e442, 2006.
7. Fahy, RF, and Molis, JL. Firefighter fatalities in the United States-2018. Quincy, MA: NFPA Research, Data, and Analytics Division; 2019.

References

8. Langford, E, Snarr, R, Abel, M. Implications of Aerobic Fitness on Firefighters' Occupational Performance, Health, and Risk of Injury. NSCA, TSAC Report, Volume 59, Issue 5, pg22-25.
9. National Fire Protection Association 1582. Standard on comprehensive occupational medical program for fire departments. Quincy, MA: NFPA Fire Analysis and Research Division, 2018.
10. National Fire Protection Association. NFPA 1583, Standard on Health-Related Fitness Programs for Fire Department Members. Quincy, MA: NFPA Fire Analysis and Research Division, 2018.
11. Alvar, B, Sell, K, Duester, P. NSCA's Essentials of Tactical Strength and Conditioning.
12. Michael H. Stone,¹ William G. Hornsby,² G. Gregory Haff,³ Andrew C. Fry,⁴ Dylan G. Suarez,¹ Junshi Liu,⁵ Jose M. Gonzalez-Rave,⁶ and Kyle C. Pierce. Periodization and Block Periodization in Sports: Emphasis on Strength-Power Training—A Provocative and Challenging Narrative
13. Eves, N.D.; Jones, R.L.; and Petersen, S.R. (2005). The influence of the self-contained breathing apparatus (SCBA) on ventilatory function and maximal exercise. Can. J. Appl. Physiol. 30(5): 507-519. © 2005 Canadian Society for Exercise Physiology.

References

14. Johnston, S, House, S, Jornet, k. Training for the Uphill Athlete: A Manual for Mountain Runners and Ski Mountaineers
15. <https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/Fire-department-calls>
16. Laukkanen JA, Mälikallio TH, Rauramaa R, Kiviniemi V, Ronkainen K, Kurl S. Cardiorespiratory fitness is related to the risk of sudden cardiac death: a population-based follow-up study. *J Am Coll Cardiol*. 2010;56(18):1476–83.
17. Albert, CM, Mittleman, MA, Chae, CU, Lee, IM, Hennekens, CH, and Manson, JE. Triggering of sudden death from cardiac causes
18. Mittleman, MA, Maclure, M, Tofler, GH, Sherwood, JB, Goldberg, RJ, and Muller, JE. Triggering of acute myocardial infarction by heavy physical exertion. Protection against triggering by regular exertion. *New England Journal of Medicine* 329(23): 1677-1683, 1993. by vigorous exertion. *New England Journal of Medicine* 343(19): 1355-1361, 2000
19. Kales, SN, Soteriades, ES, Christophi, CA, and Christiani, DC. Emergency duties and deaths from heart disease among firefighters in the United States. *New England Journal of Medicine* 356(12): 1207-1215, 2007.

References

20. Durand G, Tsismenakis AJ, Jahnke SA, Baur DM, Christophi CA, and Kales, SN. Firefighters' physical activity: relation to fitness and cardiovascular disease risk. *Medicine and Science in Sports and Exercise* 43(9): 1752-1759, 2011.
21. Gledhill N, Jamnik VK. Characterization of the physical demands of firefighting. *Can J Sport Sci.* 1992 Sep;17(3):207-13. PMID: 1325260
22. Canetti E, Dawes J, Drysdale P, Locki R, Kornhauser C, Holme R, Schram, B, Orr R. (2021). Relationship Between Metabolic Fitness and Performance in Police Occupational Tasks. *Journal of Science and Exercise* 3:179-185.
23. Dawes JJ, Lindsay K, Bero J, Elder C, Kornhauser C, Holmes R. Physical fitness characteristics of high vs. low performers on an occupationally specific physical agility test for patrol officers. *J Strength Cond Res.* 2017;31(10):2808–15
24. Allen P, Bennett K, Heritage B. SPSS statistics: a practical guide. 4th ed. Melbourne: Cengage; 2019. pp. 179–97.
25. Silk A, Savage R, Larsen B, Aisbett B. Identifying and characterizing the physical demands for an Australian specialist policing unit. *Appl Ergon.* 2018;68:197–203.
26. Wilmore JH, Knuttgen HG. Aerobic exercise and endurance. *Phys Sportsmed.* 2003;31(5):45–51.
27. XU, Jiaquan, et al. "Deaths: Final Data for 2019." *National Vital Statistics Reports*, vol. 70, no. 8, 26 July 2021, pp. 1-87
28. https://www.nvfc.org/wp-content/uploads/2015/09/Obesity_Study.pdf
29. Robinson, J.; Roberts, A.; Irving, S.; Orr, R. Aerobic Fitness is of Greater Importance than Strength and Power in the Load Carriage Performance of Specialist Police. *Int. J. Exerc. Sci.* 2018, 11, 987–998