3472 *Board #193* **June 2** **8:00 AM - 9:30 AM**

Relationships Between Specific Back-Fitness Tests and the Occurrence of Back Injuries in Firefighters

Karlie J. Moore, Salvador Jaime, Katherine B. Gunter. *Oregon State University, Corvallis, OR.*

(No relationships reported)

Firefighters (FFs) experience a high incidence of back injuries; near 50% of FFs have experienced at least one back injury throughout their career and the primary reason for early retirement from disability is back injury. An assumption exists that fit FFs experience fewer back injuries, yet the true relationship between FF's fitness level and incidence of back injury is understudied. It is not clear what specific aspects of fitness are related to the occurrence of back injuries or what tests may be conducted to better understand a FF's risk of experiencing a back injury.

PURPOSE: To investigate the relationships between specific back-fitness tests and the occurrence of back injuries in firefighters.

METHODS: 118 FFs from three fire departments completed a back injury survey and eight back-fitness tests: A modified Schober test for lumbar flexion (LF) and lumbar extension (LE), a trunk rotation flexibility test to the right (RR) and left (RL), a back endurance "row" test with 20 lb weights (BE), a back strength test using dynamometry (BS), a hamstring endurance "kickback" test (HE) and a prone chin-up test (PC). The survey asked if FFs had experienced 0,1,2 or 3+ back injuries throughout their careers along with other relevant parameters. A zero-inflated poisson regression was utilized to 1) identify the variables that predict injury rate, and 2) identify the variables that predict the FFs who never experience back injuries. To account for exposure time, # of years as a FF was included in the model.

RESULTS: 59 FFs reported 0 back injuries, 24 FFs reported 1, 14 FFs reported 2, and 21 FFs reported 3+ back injuries. The # of injuries was significantly related to LE ($p<.01$) and BS ($p=.05$). For FFs who reported ≥ 1 back injury, improving LE capability by one cm lowers the expected # of back injuries during a career by 34.4%. For every standard deviation increase in BS (27 kg), a FF's odds of never having a back injury improve tenfold. There was no association between # of back injuries and LF, RR, RL, BE, HE and PC.

CONCLUSION: Possessing an adequate level of back strength and lumbar flexibility appears to reduce the risk for back injuries among FFs. An intervention needs to be conducted to confirm that improving/preserving these aspects of fitness lowers the occurrence of back injuries for FF's.

3473 *Board #194* **June 2** **8:00 AM - 9:30 AM**

Physiological Measurement Comparison From A Portable Sensor System And Standard Laboratory Equipment During Graded Exercise

Jeffrey B. Powell, Aitor Coca, Kim Jung-Hyun, W. Jon Williams, Raymon J. Roberge. *NIOSH/CDC/NPPTL, Pittsburgh, PA.*

(No relationships reported)

Physiological monitoring in real time can offer valuable information on the biomedical status of workers engaged in strenuous activities**.**

PURPOSE: This study compares the accuracy of a commercially available portable sensor system to standard laboratory physiological monitoring equipment for real-time monitoring of heart rate (HR) and respiratory rate (RR) responses during treadmill exercise**.**

METHODS: Six healthy subjects completed a maximal graded exercise test (GXT) wearing the portable sensor system and a standard laboratory physiological monitoring system. The treadmill protocol consisted of stages in which workload increased every 30 seconds starting at 1.7mph/0% incline and ending at 3.5mph/25% incline. The study variables, HR and RR, were recorded simultaneously breathe by breathe using the two systems. The variables were then summarized at time points of rest and workloads (O_2) equal to 30, 50, 70, 90 and maximum. Paired sample t-tests and Spearman correlation coefficients (r_s) were calculated to compare the variables**.**

RESULTS:

VO2	Heart rate (beats·min-1)				Respiratory rate (breaths·min-1)			
	Standard	Portable	p	rs	Standard	Portable	p	rs
Rest	72.0(7.3)	76.5(7.2)	0.04	.89	16.0(6.7)	16.2(4.0)	> .05	.71
30%	96.3(5.8)	109.3(14.5)	0.03	.32	23.8(4.9)	22.4(5.0)		.94
50%	128.7(13.5)	130.3(8.7)	> .05	.90	28.2(5.9)	25.7(4.8)		.83
70%	146.3(6.9)	146.9(6.5)		.94	32.0(5.4)	31.7(5.2)		1.0
90%	171.3(9.3)	171.7(8.4)		1.0	37.5(9.5)	37.2(9.1)		1.0
MAX	182.2(9.9)	181.2(8.3)		1.0	42.8(12.4)	41.8(10.9)		.94

Values are mean (SD) (n=6), VO_{2max}: 50.8 (4.3) ml/kg/min, p-value: Paired samples t-test

CONCLUSION: The results of this study show HR and RR measurements by portable sensor system in subjects performing GXT are comparable to those from a standard physiological monitoring system. However, there was a greater HR measurement variability during rest and exercise less than 50% VO2max, while HR and RR measurement accuracy increased at higher exercise intensities. This study demonstrates the accuracy of the portable sensor system for real-time monitoring of physiological parameters and suggests usefulness for physiological research in the field.

3474 *Board #195* **June 2** **8:00 AM - 9:30 AM**

Self Reported Exercise during Deployment Correlates with Measured Fitness Outcomes

Bradley J. Warr[1], Brent A. Alvar[2], Marilyn A. Sharp[1]. *[1]U.S. Army Research Institute of Environmental Medicine, Natick, MA. [2]Rocky Mountain University of Health Profession, Provo, UT.*

(No relationships reported)

There is currently little data evaluating soldiers' physical activity levels and exercise programs or the accuracy of surveys to characterize fitness training during deployment. The typical deployed unit conducts 24 hr operations, making unit level physical fitness training difficult to conduct; most soldiers maintain their fitness by completing training in an autonomous manner**.**

PURPOSE: To determine the validity of survey questions regarding frequency and duration of purposeful exercise in deployed soldiers**.**

METHODS: Seventeen male infantry soldiers (age=26$\pm$5.7 y/o, ht=178.5$\pm$6.2 cm, wt=83.9$\pm$11.8 kg) from the Arizona National Guard completed a VO_2 peak test (VO_2), 1RM bench-press (BP), 1RM back-squat (BS), and survey questions pertaining to frequency and duration of aerobic exercise, strength training, and sports participation. Fitness testing and surveys were completed both prior to deployment and within 10 days of returning from deployment. Spearman Rho correlations were used to determine significant relationships between survey questions and measured physical fitness variables, with $p \leq .05$**.**