Physiological Health Assessment System for Emergency Responders

PHASER

Introduction and Specific Aims

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PHASER primary national objective

• Firefighters - highest occupational rate LODD due to sudden cardiac events
• USFA Goal – decrease LODD by 25% in 5 years and 50% in 10 years
• A primary national objective is the development of a breakthrough in assuring health and safety for the emergency responder community.
• Requires state-of-the-art approach combining medical science with technological innovations
PHASER specific aims

1. Comprehensive risk identification and prioritization
2. Sensor selection and evaluation
3. Laboratory-based physiological experiments
4. Field-based monitoring and risk stratification
5. Implementation of a low-cost networked system for physiological monitoring and intervention
6. Outreach to emergency responders, the public, academic institutions, industry and other government agencies
PHASER: Safety objective

To enhance the safety and to protect the well-being of emergency responders

❤ Safety of the individual emergency responder

❤ Safety of the emergency responder team

❤ Safety of the victims
Risk factor prioritization

**Major Risk Factors (the big 5!)**

- Deconditioning/Fatigue
- Dehydration/Heat stress
- Added weight/isometric load
- Exposure time
- Traditional cardiovascular risk factors

**Risk Mitigation**

- Fitness training
- Pre-hydration/Fitness training
- Ideal body weight/Lighter PPE
- PPE modification/Fitness training
- Screening/Lifestyle modification/Fitness training
Factors increasing cardiovascular stress

- Deconditioning
- Dehydration
- Added weight
- Isometric load
Factors reducing cardiovascular stress

- Fitness enhancement
- Prehydration
- Ideal body weight
- Lighter PPE
- Improved work efficiency
Effect of added weight on cardiovascular strain

*Ctrl < WV, PPE; p < 0.05
Heart rate and activity level: Incremental treadmill test

Data obtained using Zephyr Bioharness™
“Cardiocaloric index”: proof of concept
“Cardiocaloric index”: proof of concept

Sub 2 10/20/10

Running = 160 /min

Walking = 40 /min

Heart Rate (min)

Activity (VMU)
PHASER-Net

- Net-Safe (emergency responder risk detection and mitigation)
- Net-Fit (emergency responder fitness enhancement)
- Net-Select (physiological sensor selection and validation)
S = Sensors/Systems being Tested
ER = Emergency Responder
Opportunities for physiological monitoring

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<th>Baseline</th>
<th>Training</th>
<th>Emergency Operations (on mission)</th>
<th>Rehabilitation (on mission)</th>
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<tbody>
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<td>12-lead ECG</td>
<td>Category of activity</td>
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<td>Heart rate recovery</td>
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<td>Intensity of activity</td>
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<td>12-lead ECG</td>
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<td>Breathing frequency</td>
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<td>Ventilation</td>
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<td>Carbon dioxide output</td>
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<td>Electroencephalogram (EEG)</td>
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PHASER: Collaborations

Please visit our website: [http://phaser.med.ucla.edu/](http://phaser.med.ucla.edu/)
Thank You