CASE STUDY:

Physical Status Monitoring and Counter-terrorism

32nd Maryland CST





CST or Civil Support Teams are fully equipped and staffed units whose role is to support state and local authorities in the event of chemical/ biological / nuclear incidents. They respond to and mitigate these potential threats.

CST incidents can occur anywhere and anytime, and personnel are required to deploy in situations that can be challenging both environmentally and technically.

Real-time, remote physiological monitoring is one way in which HAZMAT incident commanders can improve the visibility they have of their down-range personnel in these challenging environments.

Zephyr Technology has recently trialled its FRS real-time monitoring product with the 32nd CST (Maryland) during a counter-terrorism field exercise. The 32nd had been alerted to a vessel in the Baltimore Inner Harbour suspected of carrying smuggled nuclear materials.

In the course of the rapid response by the 32nd to this incident, the insertion teams fitted their Zephyr hardware, along with their SCBA and level A CBRN protective ensembles, and were on board the targeted vessel within minutes. When on board, the teams searched for, located and extracted samples of the hazardous material from the bilges of the vessel.

During the exercise the FRS system allowed the 32nd CST Medical Officer to continuously monitor the physical status of his down-range personnel.

According to the 32nd CST's Medical Officer, "The visibility into the physical status of our teams today clearly illustrated the high workloads they are under, particularly when wearing SCBAs and high-level CBRN protective ensembles. This capability would certainly help us to manage our teams more effectively in future"

In all scenarios, data analysis and user feedback have shown that the FRS:

- Is simple and easy to deploy.
- Is comfortable and unobtrusive to wear.
- Provides excellent, reliable signal and data quality.
- Provides information that assists an incident commander in tracking the physical status of his down-range personnel.

"We know our teams work hard. Being able to see how hard they work in real-time using Physical Status Monitoring technology is an important capability that will help us do our job better, and look after our personnel at the same time".

Medical Officer, 32nd CST

CONTACT US
Web: www.zephyr-technology.com
E-mail: info@zephyr-technology.com
Ph: USA: 443 569 3603
ROW: +64 9 574 6523

Zephyr™ Measure Life... Anywhere

CASE STUDY:

Physiological Response to a Surprise Dog Attack

This case study will show the physiological response to a unexpected dog attack over a 90 second period. Dog attacks stimulate a flight or fight adrenaline response in a human being. The subject fortuitously wore a physiological sensing device measuring heart rate, breathing rate, temperature, activity and posture.

The Attack

The subject was attacked after 1 hour of road running. The dog attack started with one bite to the lower right leg, tripping the subject resulting in the subject on his back, defending repeated biting attacks to the lower limbs and body. Attack duration was 90 seconds with approximately 5 attack/kick episodes. Several bite injuries to the lower right leg and foot where sustained during the initial attack and subsequent ground based period.



Figure 1 Example bite to anterior lower limb

Baseline Physiology

Prior to the attack ; HR, = 170 bpm, BR = 40 bpm. Tskin = 29.2 oC.

Age calculated HRmax = 178 bpm. Prevous HRmax induced by a hill climb = 181 bpm.

Physiological Response to Attack

Heart rate from adrenaline response increased above maximum predicted heart rate. Initial 30 second period HR increased from 171 bpm to 191 bpm. An increase of 20 bpm.

Breathing rate during running averaged 40 bpm indicating near Anaerobic Threshold. During the attack the BR reduced due to lowered metabolic load. This result follows adrenaline not influencing respiration.

Temperature increased from 29.8oC to 32 oC. Increase in skin temperature is probably a result of peripheral blood flow due to adrenal response. The subject wore a raincoat so reduction in air flow can be discounted as a reason for this increase.

Software system used is OmniSense ANALYSIS and the sensor used BioHarness Bluetooth are both supplied from Zephyr Technology Corp. Sensing garment was a flame retardant loose fit shirt with fabric sensors embedded. The shirt was being worn as part of ongoing system and comfort testing for the US Special Forces.

www.ZephyrAnywhere.com

info@zephyr-technology.com

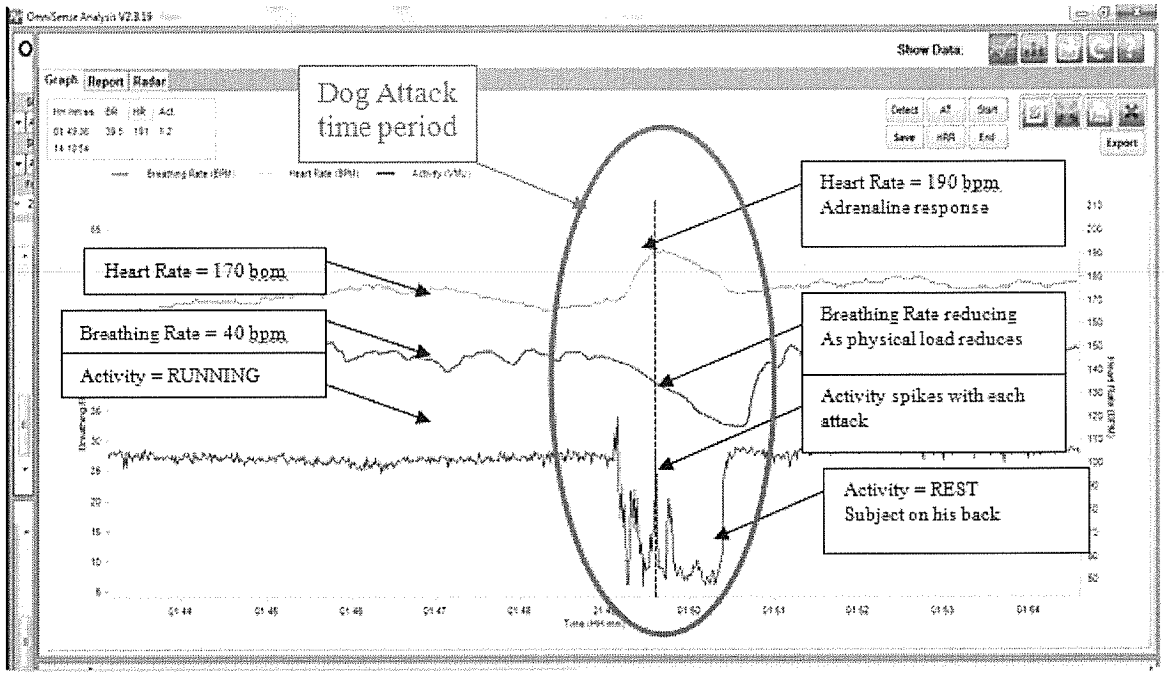


Figure 2 Physiological response graphs

Summary

The results from this unplanned event confirms laboratory results showing the physiological response to sympathetic nervous system stimulation.

Heart rate increased by 20 bpm, to above maximum calculated and measured during maximal effort. Heart recovery (exercise to rest transition) for subject is -10 bpm, indicating sympathetic induced heart rate may be greater then 30 bpm.

Breathing rate decreased due to reduced metabolic load as expected.

Skin temperature increased due to increased peripheral blood flow and reduced blood flow to lower limbs.

This paper confirms physiological response to acute stress during a stress. Acute stress was during an unprovoked dog attack.

Further Reading

1/
Acute Stress Reaction,
http://en.wikipedia.org/wiki/Acute_stress_disorder
2/
Sympathetic nervous system,
http://en.wikipedia.org/wiki/Sympathetic_nervous_system

References:

1/
Stress and Aggression,
http://www.apa.org/pubs/journals/releases/bne-11851062.pdf
2/
Bodily Changes in Pain, Hunger, Fear and Rage: An Account of Recent Researches into the Function of Emotional Excitement.
Walter Bradford Cannon (1915).