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## Abstract Details:

**Breakout Session:** Wearable Sensors for Human Monitoring  
**Category:** Poster only  
**Title:** Usability and Comfort Assessment of Commercial Biosensors for Team Monitoring in a Military Field Event  
**Abstract:**

Background:

The Signature Tracking for Optimized Nutrition and Training (STRONG) laboratory and the Warfighter Effectiveness Research Center (WERC) host an annual field test and evaluation (T&E) event to assess readiness levels of prototype and/or commercial biosensors. This year's event examined the usability and comfort of three commercial biosensors: 1) MX3 – A point-of-care saliva sensor for hydration monitoring, 2) Firstbeat Live – A team cardiovascular [e.g., max heart rate, training impulse (TRIMP), training load, etc.] monitoring system, and 3) VX Sport - A team cardiovascular and behavioral (e.g., speed, distance, etc.) monitoring system.

**Event Details:**

The T&E event occurred on two consecutive days in November 2019 at the Air Force Academy's Jack's Valley complex. Each test day was comprised of an identical field events [comprised of a warm-up (calisthenics), 1.5-mile loaded ruck (depart), 0.25-mile gear carry, 1.5-mile loaded ruck (return), and village clearing and rescue scenario] used to mimic USAF Special Operations training.

Event performers (Day 1, N = 5; Day 2, N = 8) were members of the Academy's Sandhurst and Combat Shooting teams. Event observers included representatives from government agencies with a stake biosensors, such as U.S. Special Operations Command, Homeland Security, DoD Acquisitions Officers, and DoD/Academic Scientists.

**Methods:**

For each test day performers donned and interacted with the biosensors as appropriate for their intended use. Alternatively, observers were ask to evaluate sensor usage/utility throughout the event. To facilitate these evaluations observers were provided access to 'live' sensor informatics and after action reports made possible through mobile phone application and demonstration booths set up intermittently throughout Jack's Valley. Upon completion of each test session performers and observers we asked to assess sensor comfort (1-10 scale) and/ or usability (1-5 scale) via survey.

**Findings:**

Firstbeat usability (M = 3.6, SD = 1.3) and comfort (M = 7.4, SD = 0.7) were moderately high. Specific feedback included praise for the ease of data interpretation in both 'live' and after action formats. However, performers and observers identified a need for improved form factor (an alternative to the heart rate chest strap and puck placement) and the inclusion of mechanical/behavioral load estimates. Usability (M = 3.5, SD = 1.4) and comfort (M = 7.0, SD = 0.9) for VX Sport were also moderately high, with specific feedback including the need for an alternative form factor to the worn 'vest' and the need for more concise user interface and after action metrics. Finally, MX3 usability was also moderately high (M = 3.7, SD = 0.3) with most observers and performers noting the fast and clear results for team hydration monitoring. However, common feedback included a desire for the system to be more compact (for easier inclusion in a ruck) and a requirement for improved sensors reliability (it often took more than one attempt to obtain a reading when performers had dry mouth).

**Conclusion:**

Following this event researchers and acquisitions officers have identified areas for improvement with these technology and are engaging in a set of funding and research strategies to address these concerns. Conversely, a number of representatives from DOD units have decided to purchase these biosensors for immediate integration into operational use.

**Disclaimer:** We have no conflicts of interest to report. The opinions expressed here are our own and do not represent those of the U.S. Air Force

**Learning Objectives**

1. Describe
2. Discuss
3. Integrate

**Submit for Young Investigators Competition?** No

**May We Publish Abstract on the MHSRS website?** Yes