Research Experiences for Teachers and Young Scholars in Advanced Self-Powered Systems of Integrated Sensors and Technologies (ASSIST)

Stress Monitoring Wearable Device for Longevity of Life

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Motivation and Objective

This research aims to develop a micro wearable device (Gen 2.0) to increases the longevity of life by tracking stress indicators namely Electrodermal activity (EDA) and Electrocardiogram (ECG) in real time. The point-of-care is on the person allowing for sample collection outside the clinical setting.

Hardware

Commercial
Desktop BioPac®

Actual Photos in ASSIST Lab

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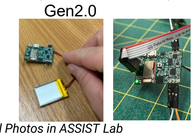
Our Bio-Wearable
Device

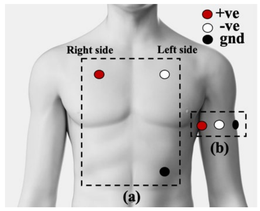
(*board-size1"x1.5*")
Gen2.0



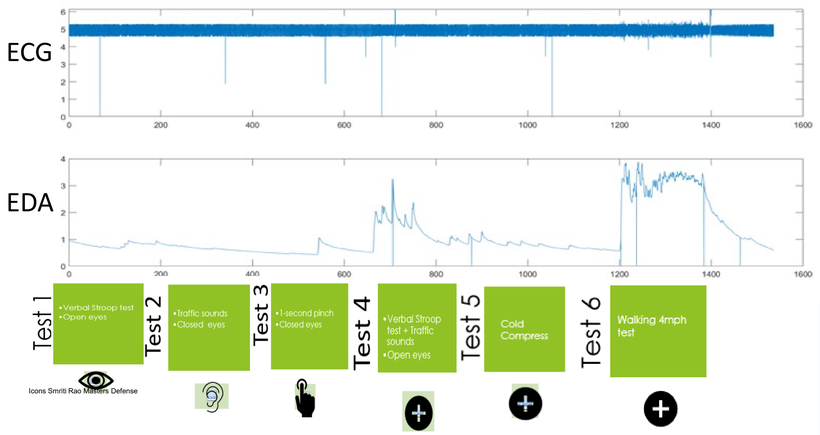
I Photos in ASSIST Lab

Engineering (indirect team work) A 3D printed housing with strap to house the micro circuit board by use of a recommended (Preform3) 3D printer.

Engineering (direct team work) The micro circuit board, Gen2.0 programed with Nordic microcontroller to collect ECG and EDA data, simultaneously. The micro board is strapped to the left upper arm for readings with higher signal to noise ratio and wearable portability. Timed tests and transfer the data to the computing unit either are accomplished directly or via Bluetooth low energy (BLE) module. The single lead ECG port connects to three electrode pads located on the upper arm at positions optimized to obtain high quality signals. The data acquired using the presented unit was then compared to a commercial desktop BioPac® system for system validation.

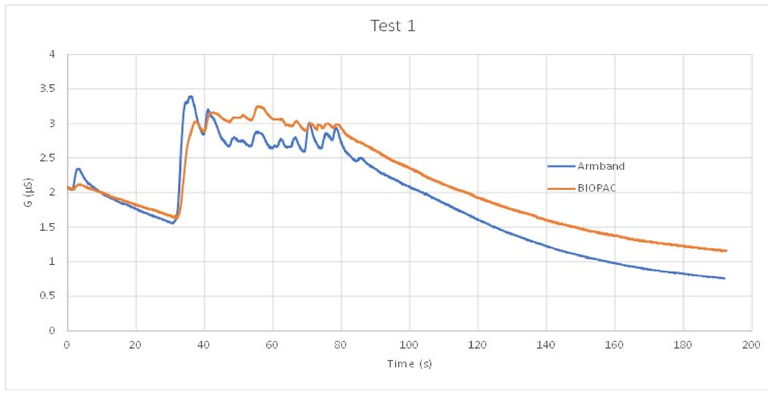


Methods and Results



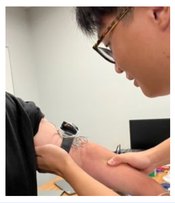
Our Gen2 bio-wearable indications during test events

A series of timed stressor events were applied in a quiet room with a consistent setting and no physical movements except the walking test.



Our Gen2 wearable (armband) -vs- desktop BioPac®

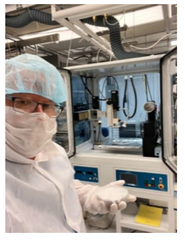
Separate testing showed our Gen2 bio wearable device indicated similarly with the desktop BioPac commercial device.



Future Research

As research and engineering designs continue such solutions to achieve better performance, more portability and less or no battery required. To include WIFI data transfer for board, power from the human body electrolysis, and flipping the testing for stress recovery stimuli with music, relaxing sounds or visual.

Nano Fiber (Electro Spinning) electrode pads can be created to get potentially better attachment to the body, higher conductivity and more mechanical durability. The importance and further progresses in making such devices may well contribute to the making of more reliable devices capable of wireless and IoT (Internet of Things) functionalities for point of care diagnostics.



Actual Photos in ASSIST Lab and "Clean Room" Electro Spinner

Acknowledgement

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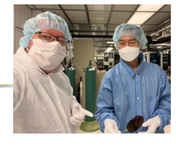

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