Wearable Device for the Management of Panic Attacks

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The Problem

Panic attacks can be embarrassing and disruptive. Many of those suffering from panic attacks choose not to seek treatment, and may miss out on work, school, or life events for fear of having an episode. Biofeedback therapy has been shown to be effective in eliminating panic attacks but is not an attractive option because of the time and cost. Several wearable devices on the market have been proven to be successful at managing or even eliminating panic attacks but are too obtrusive for use in public.

Our Solution

A discreet wearable device will provide insight and help guide the wearer through an attack.

A discreet, wearable biofeedback assistive device consisting of two elastic belts worn on the upper torso, with three built-in sensors and a few small motors can help manage recurring panic attacks. The device will provide ambulatory monitoring and constant, real-time analysis of sensor data through an Android app. Data will be compared to known symptoms of panic attacks to detect an episode, and (immediately and unobtrusively) intervene.

Hardware Design

An Android app has been developed using the Android Studio IDE to receive biological signals from an Arduino microcontroller sewn into the fabric of the wearable device. The Arduino (programmed with Simblee BLE firmware) sends collected data via Bluetooth Low Energy to the smartphone, where it is processed, analyzed, and graphed for interactivity.

The app consists of an algorithm for detecting panic attack symptoms from sensor data, calibration settings, graphically displayed data, annotation capability, and a function to manually start breathing exercises to manage a panic attack.

Software Design

A discreet wearable device will provide insight and help guide the wearer through an attack.

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Performance Metrics

- Clear, Intuitive UI
- Noise Filtering, Data Accuracy
- Visual Appeal and Ease of Use
- Subtlety, Comfort and Durability

Ethics Statement

The code developed for this project was written by our team or modified from freely available open source software. This device is not a medically approved device and is not proven to aid with panic attack symptoms in all wearers. This device was designed to fit adult users of all gender and body types. Data privacy for medical devices was considered in the design.

Component | Function
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Heart Rate (ECG) Sensor | Detects elevated heart rate caused by stress
Strain Plethysmograph | Measures breathing rate and volume
Galvanic Skin Response (Electrodermal Activity) Sensor | Detects sudden and intense changes in emotion
Inertial Measurement Unit | Detects physical activity as a control for false positives
LilyPad Arduino Simblee BLE | Collects sensor information and transmits via BLE to Android
Two LilyPad Vibe boards | Provides silent haptic feedback to guide user through breathing exercises
16-to-1 Multiplexer | Allows many more inputs to be read by Arduino
Lithium polymer battery | Provides 2000 mAh of DC power to system