Problem
Panic attacks can be embarrassing and disruptive.

Those who suffer frequent panic attacks need a way to subtly monitor and manage these episodes. Symptoms of a panic attack include: heart palpitations, accelerated heart rate, sweating, trembling, abnormal breathing, chest pain or discomfort, nausea, dizziness, or fear of dying.

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

A wearable biofeedback device with discreet built-in sensors can help manage embarrassing, recurring panic attacks. The device will provide ambulatory monitoring and real-time analysis of biometric signals, comparing features of the data to known panic attack symptoms to detect an episode, and immediately intervene.

Hardware

- **Heart Rate Sensor**
  Detects elevated heart rate caused by stress

- **Strain Plethysmograph**
  Measures breathing rate and volume

- **Galvanic Skin Response Sensor**
  Detects sudden and intense changes in emotion

- **Inertial Measurement Unit**
  Detects physical activity as a control for false positives

- **Raspberry Pi 2 Model B**
  Collects and analyzes data from the wearable device

- **Vibration Motor**
  Guides the user through breathing exercises

<table>
<thead>
<tr>
<th>Control Signal</th>
<th>Abnormal Biometric Signal</th>
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</thead>
<tbody>
<tr>
<td>IMU</td>
<td>Increased heart rate due to activity</td>
</tr>
<tr>
<td>Temperature</td>
<td>Increased respiration due to activity</td>
</tr>
<tr>
<td>Voice Sensor</td>
<td>Increased skin conductance level due to heat</td>
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**False Positive Indicator**

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
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<tbody>
<tr>
<td>Primary</td>
<td>Red</td>
</tr>
<tr>
<td>Secondary</td>
<td>Yellow</td>
</tr>
<tr>
<td>No correlation</td>
<td>Green</td>
</tr>
</tbody>
</table>

Design Overview

- **System Diagram**
  - User feedback
  - System diagram
  - False positive indicator

- **Smartphone App Mockup**
  - View real-time biometrics
  - View heart rate

**Conclusion**

A panic attack is an obstruction to normal daily life that is difficult to live with. Through the use of a wearable panic attack management device, users are able to live relatively normal lives, free from stressful, embarrassing panic attacks. Long-term sensor data records and self-reported symptom history will allow users to understand and manage their unique physiological reactions and discover patterns related to their episodes. Biometric data and records of panic attacks will also provide useful information about a patient to healthcare providers.

**Ethics Statement:** Our team used only open-source and legally obtained software for the production of this project.