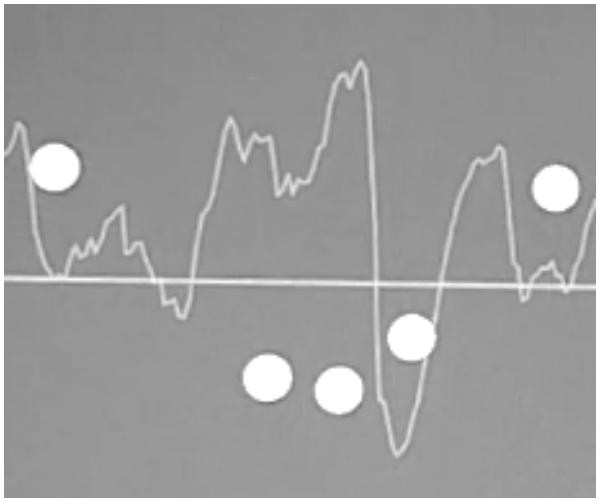
ALIVE

Alive is a wearable device that can be integrated in clothing to measure respiration.

We will demonstrate its functionality and accuracy with a p5 sketch that allows users to

interact
visualize
appreciate

the automated functions of the body that keep them alive while simultaneously understanding that they are in full control by interacting with a game interface.



VISUALIZE AUTONOMY

Breathing Game

Once the user puts on the belt, they become fully **conscious** of their breathing, and even more so when they find themselves immersed in a game that nudges them into following breathing patterns.

We designed the game to have **3** levels:

LEVEL 1

Follow the *sin* !

A score and bubbles following a *sin* curve that simulates a normal breathing pattern appears on screen. It is programmed for the user to win, with a break interval for the user to gather their breath for the next level.

LEVEL 2

Hold your breath!

We want users to visualize the contrast between breathing/not breathing.

LEVEL 3

Random!

This level is more chaotic. We received feedback during user testing stages that the experience made them very dizzy. We set the frequency of bubbles at a manageable interval but we intend for this interaction to leave a lasting impact of appreciation for the autonomy of breathing.

STEEP LEARNING CURVE

We are using a conductive stretch fabric as a stretch sensor to measure respiration. We also attempted to integrate the Polar belt to measure heartbeat. In our prototyping stages, we learned that electronics are very difficult to integrate with soft materials and wearables. What we have is a temporary solution that requires more thoughtful design, materials research, and prototyping moving forward. Its current state requires precise conditions to be effective and accurate. For example, when the wearable device is not tightly wrapped around the user, noise filters in. Biometric data is difficult to measure due to a multitude of factors including physiological noise and cross-talk contamination from neighboring muscles, motion, magnetic and environmental noise, etc. Eventually, we made the decision not to integrate heartbeat as we originally intended for this device. We found that our sensor frequently picks up environmental noise and skips beats, and we did not want to compromise the quality of our data.

ASPIRATIONS FOR FUTURE APPLICATIONS

Our objective is to make reliable wearables that make physical procedures less invasive, more efficient, and wireless with intuitive integration of sensors, conductive soft materials, and bluetooth. Instead of being hooked up to a series of wires, we want users such as patients, athletes, etc. to wear a garment with the technology seamlessly built in. Our next phase involves researching specific applications, testing conductive textiles for fabricating dry electrodes, and refining our code to present accurate data.

COMPRESSION SHIRT

We began with a shirt.

WHY does it have to be a shirt?

- Physical procedures are invasive and often require people to strip down and be in their most vulnerable state.
- Wearing clothing is not only intuitive, but is arguably the most optimal medium for measuring biometrics given its close physical contact with the body.
- Popularity of athleisure apparel has motivated a widespread shift towards monitoring health and fitness.

ADJUSTABLE BELT

For efficient user testing, we created an adjustable belt with velcro, a respiration sensor channel, and mesh zipper pocket to hold our Polar belt and electronics in place. Mesh was chosen so the Polar sensor can remain in contact with the skin.

MATERIALS

Breathable, **comfortable**, **compression knits**:

Bondage Jersey

83% VISCOSE, 12% POLYAMIDE, 5% LYCRA SPANDEX

HeatGear®

90% POLYESTER, 10% ELASTANE

EeonTex™ LTT-SLPA

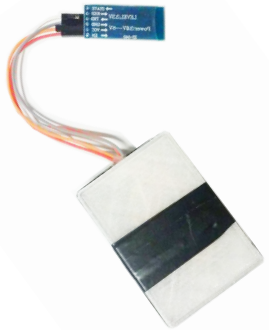
72% NYLON, 28% SPANDEX

Surface Resistivity: Tunable in the range of 10E4 to 10E7 Ohm/sq.

Elongation: warp 198–248, warp recovery 85%

ELECTRONICS

Electronic components and wires housed in a **compact** 3D printed enclosure with a convenient ON/OFF switch.



DESIGN

We referenced style lines and silhouettes from athleisure trends to encourage **adherence**, **health** and **fitness**.

CHEST POCKET

Zipper pocket opening at the chest encloses and gives **easy access** to our microcontroller, bluetooth module, and rechargeable battery.

SENSOR CHANNEL

Built-in channel for sensor to measure chest expansion. Designed with **adjustable straps** to accommodate a range of chest circumferences.