



Inspire to Respire



Scan me!

This is a universally designed comfortable and convenient t-shirt that measures one's lung volume through lightweight and seamless sensors.

APP

INTRODUCTION

Chronic lung conditions affect a disproportionately high number of people in the UK, and range from asthma, COPD, pulmonary fibrosis, etc. Many of these respiratory conditions are linked to increases and decreases in lung volume, however current monitoring techniques require hospital/GP visits, or the purchase of incredibly expensive devices called spirometers. Whilst there exist a range of medical wearables for other conditions, we noticed that very few are able to measure lung volume.

Therefore, given the potential benefits that constant monitoring would provide, we decided to create a Inspire to Respire, a t-shirt which can continuously monitor not only lung volume, but also offer a range of other features, such as sweat content analysis and heart rate amongst others. Our aim is to provide the general public with an all-in-one, affordable and stylish medical device, which may prevent the aggravation of certain conditions by acting as a preventative measure.

HOW IT WORKS

Studies show that there is a correlation between lung volume and chest expansion, and as current methods such as spirometry are impractical, our idea involves using the correlation to develop an algorithm. To measure chest expansion, the t-shirt will be lined with an expandable wire which is attached to a Bluetooth motion sensor. Upon inspiration the chest expands, and the sensor will register its movement; similarly, upon expiration another reading will be taken. Using our algorithm, we will convert these readings into lung volume which can be sent via Bluetooth connection to the app.

Other potential features we would offer include heart rate, which is measured through photoplethysmography, heart rate variability, through ECG, and sweat analysis with biosensors. This would enable people with comorbidities to have all their tracking and data in one place, which is much more convenient than keeping track of multiple wearables.

PROBLEM IT SOLVES

- The sensors are less visible as it can be worn underneath clothing, as well as the fact that the sensors are concealed. This may reduce how self-conscious one feels.
- Our t-shirt is designed not to interfere with day-to-day function, as it is lightweight and available in a range of materials.
- One key benefit is that it can detect attacks or worsening of a person's condition earlier due to constant monitoring. This allows us to focus on prevention over cure, which is increasingly important to reduce the burden on the healthcare system. Furthermore, it can provide reassurance and peace of mind to the wearer as they will be alerted in case of emergency.
- There are a number of wearables available on the market, each one performing a different function. This can be inconvenient if each is linked to different apps, however our t-shirt is designed so that sensors can be added on dependent on a patient's condition, and all their data can be accessed in one place/
- Lastly, spirometers can cost in the high hundreds, therefore our t-shirt offer a cheaper and much more convenient alternative to traditional methods of measuring lung volume.

COSTING

We estimate the t-shirts alone to cost between £5-£10, depending on design, colour and size. Although it is difficult to estimate the cost of the sensor, as we are yet to conduct trials to make a prototype, the lung volume sensor and wire relies on motion detection technology. A rough estimate of the cost ranges from £50-£100 once produced in bulk. Other features and sensors can be added on depending on the person's medical requirements, but we estimate the basic t-shirt to cost somewhere between £55 to £110 to produce.

In order to make it accessible on the NHS, we propose a prescription model, wherein a person can split the cost of the wearable into £9.35 instalments. Alternatively, it will also be available under a PPC (prescription prepayment certificate).



DESIGN

We designed two different t-shirts to cater for different age groups. The adult design is a plain t-shirt, which can be customised as per their preferred choice of colour. The design is not only sleek, but it is also suitable for a range of weather conditions, as it can be worn by itself or under other clothing.

For our second design, we noticed that there was a lack of medical wearables which cater towards a younger demographic, and therefore decided to implement 'kid-friendly' designs to conceal some of the sensors. We understand how difficult it can be for a child to suffer from lung diseases such as asthma, and therefore deemed it important to have a fun design. One of our ideas for this was a duck-themed t-shirt, which features a button which when clicked generates a 'quack' sound. The aim of this would be to make the child less self-conscious if they are struggling with their condition.

The t-shirt will be made of 100% organic cotton, which is both sustainable and comfortable to wear. Alternative materials will also be available for those who require a sweat-free version, eg nylon for sportswear



Click on the link below for an interactive prototype of our app, or scan the qr code above:
<https://app.moqups.com/jPylj7pfWexo8tebs3Sn3cmfV0tIM66V/view/page/a516eb936>

In order to allow the average person to monitor their lung health on a daily basis, we created a simple app that is quick and easy to use. This reduces the reliance on GPs and hospitals, as people can keep track of their health at home. The app is connected to the sensors via Bluetooth, and through one connection, multiple pieces of data can be received in a single click. There will also be the option to send your data to your local GP, through a partnership with the NHS.

In the case of any alarming readings, you will receive notifications on your phone, as well as a beep on the shirt if you do not have your phone to hand. If the situation continues to deteriorate, appropriate advice will be available on the app.

IMPLEMENTATION

