Overview

Halare presented the team with the issue of teaching children a better way to breathe so that they would be able to control asthma and other breathing problems without the use of medicine. A breathing method called the Buteyko method was to be taught to children through the use of a headset to be designed by the team. It had to incorporate various sensors and audio prompts to keep the children correctly practicing the method for 20 minutes a day.

Objectives

The main objective was to create an effective headset for teaching the Buteyko method that was comfortable, adjustable, cost-effective and fun to use while incorporating an accelerometer, heart rate sensor and flow rate sensor to monitor the child.

Approach

- The first step was to identify customer needs through speaking with our sponsor and using a pair wise comparison chart.
- Other similar devices were explored via patent searches to see what was on the market.
- The problem was clarified through a black box model and TRIZ chart which the team used to generate the first design concepts.
- Preliminary concepts were designed in SolidWorks and reviewed by the team and sponsor to identify the best design while a Pugh concept chart helped the team to settle on a design.
- Thought experiments, existing equations associated with the sensors, and a needs-metric’s matrix were used to analyze the design.
- Once the final design concept was selected, a rapid prototyped model was created to better visualize the concept. A final prototype was then created from off the shelf headphones.
- The final prototype incorporated a DAQ device and LabView to analyze the sensor data which provided the test results for the device.
- The LabView interface compared with the Buteyko method validated the results from each sensor.
- Each sensor produced its own data which was analyzed based on expected physiological results.

Outcomes

The final design successfully incorporated each sensor and effectively teaches the Buteyko method.
- Halare now has a breathing aid for children to complement the adult version from last year’s project.
- Concepts were generated that Halare can use in modifying the adult version and commercially producing a child’s breathing aid.
- The design was made for < $50, a goal set by the team and Halare, which gives them a cost effective device.
- The device incorporates an accelerometer and fun gaming ideas not yet seen in any of Halare’s products.