Designing a Thoracic Compression and Posture Correction Device for Brass Musicians with Pharyngoceles: A Teaching Opportunity

Susan Sokolowski, PhD and Brittany Lang
University of Oregon, USA

KEYWORDS: Design, Compression, Posture, Teaching

Brass musicians exert high pressures throughout their bodies when playing, and overtime they can establish pharyngoceles. These are balloon-like protrusions that project through the wall of the pharynx and can over-stimulate the Vagus nerve. This nerve is the longest cranial nerve; it supplies function to and controls taste from base of tongue and epiglottis, sensation of the soft palate, upper larynx and carotid body, and motor function to most of the soft palate, pharynx, heart, lung and intestinal muscles (Netter, 2014). When this nerve is stressed, the brass musician can develop extreme pain, nausea and psychological distress.

This condition was explored as a studio topic, for a senior level Product Design class. Students were tasked to innovate products for practice, performance or recovery, in an attempt to reduce the symptoms caused by the pharyngoceles. Students worked with a World Class trumpet player who had this condition. They built together a qualitative questionnaire and conducted user research to learn in-detail about the condition and attempts already made to reduce symptoms. From the research, each student built a specific product strategy around how they were going to solve the problem, and then through prototyping 1:1 scale models, students were able to iterate and validate their ideas through feasibility testing by the trumpeter.

When ideating particularly for products used for trumpet practice, it was hypothesized that thoracic compression and posture correction may be used to reduce the symptoms of pain, nausea and psychological distress associated with the pharyngoceles. The idea was inspired by a product used by singers, called a “singing belt.” This is a training device made of adjustable nylon straps that teaches a singer how to use his/her diaphragm & master breath. It targets muscles of lower rib cage & back without constricting the abdominal wall. The theory is, could a device be made to affect the efficiency of trumpet playing through compression and posture control, so there is less stress on the body, especially the Vagus nerve? Through apparel draping, a thoracic compression and posture correction product was created – called Pavana (Sanskrit for: pure, air, water and breath) (Figure 1). Upon initial feasibility testing, the trumpet player helped advised on coverage and fit of the device.

“My diaphragm was sore immediately after. The immediate benefit I found was that I had all this ‘feedback’ in my diaphragm & core while I was playing. I find myself wanting to experiment with this more.”

- Brian McWhorter, World Class Trumpeter (2016)

Figure 1: Draping the Thoracic Compression and Posture Correction Device

After the second round of iterations the trumpet player felt muscle soreness in his sides, but he did not have the severity of post-play symptoms, as he had without wearing the device. Over time, he felt less irritable, had less pain in his pharynx and was able to play for extended periods of time.

There were several discoveries made during this course format. First, was that working with a World Class musician who has an "extreme" condition emotionally connects students quickly to the design process, and they therefore want to put time into understanding the problem and creating clear problem solving statements. They want to succeed because the cause is real. For this specific course, the user agreed to spend every other week in class with the students to provide insights or critique work. By having the user physically present in class, it prompted students to produce higher quality work, as the user was personally interfacing with prototypes – so they had to be made out of the right materials, fit properly and physically work so the user could assess the performance of each concept. In this course, each student also managed their own project strategy and that too proved successful, as they were able to take into account their strengths as a designer and drive the design process according to their abilities. For example, some of the students in this course worked in 3D and printed parts, where others draped and sewed concepts. Lastly, topic-wise, designing for musicians is a completely untapped space. Given that most universities have music programs, there are a lot of opportunities for professors to provide great design problems to their students. Class projects like this will be continued in our program by working with local users that have unique medical conditions or disabilities.

Bibliography:

Netter, Frank H. (2014). *Atlas of human anatomy: Including student consult interactive ancillaries and guides*. Philadelphia, PA: Saunders

Singingbelt. (2016), *What is the singing belt: Breathing for singing made easy.* Retrieved from http://singingbelt.com/learn-how-to-sing-with-singing-belt/