Get Your Head in the

Game

Custom Assistive Headset

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Problem Statement

- The client would like the work at the front desk and needs a device to help him hold a phone, so he can write and talk on the phone simultaneously
- The client has the use of one hand and cannot hold the phone between his head and shoulder
- The device will need to accomodate for a larger head and smaller ears, which many current options do not accommodate for

Background

- There are devices that can hold existing phones for users.
    - The suction cup can hold a cell phone, which is smaller than the client's desk phone.
    - The neck lanyard can hold a phone for the client to use on speaker phone or with earbuds.
- Neither is ideal since the workplace is too loud for speakerphone, and the client cannot put anything in his ears.

Background

- Other devices can plug into existing phones or connect by bluetooth.
    - They feature headphones for the user to place in or over his/her ear canals, typically connected by a hard headband
    - These devices are not ideal since the client cannot place anything into his ears, and the bands are typically too small to accomodate for his head size.

Prototypes: Velcro Hat

- The velcro hat features a visor with a piece of velcro attached to the inside.
- Uses the external phone to avoid using bluetooth or wiring a device to use the headphone jack
- Another piece of velcro is attached to the phone to easily attach the phone to the hat.
- Difficult to put on with one hand
- May add pressure to the head due to the phone's placement.

Prototypes: Headband Pocket

- Fabric band with an elastic sewn inside, and a pocket for the existing phone
- Uses the external phone to avoid using bluetooth or wiring a device to use the headphone jack
- Snaps on the phone pocket allow it to be easily attached and removed from the headband.
- However, the phone weighs down one side of the headband, which can cause discomfort

Current Prototype: Adaptive Headphones

- Modified over-the-ear headphones with telemarketer headset speaker and microphone
- Longer aluminum band, longer microphone which works in far proximity to user
- 3D printed microphone adapter
- Wires for microphone and speaker were soldered onto circuit board
- Able to be put on and taken off with one hand
- 3.5 mm headphone jack
- Covered in foam and Star Wars fabric

Design Study: Styrofoam Head

- Tested whether the headband pocket would leave any pressure marks and how long it could stay on the head
- There were no marks left behind and minimal slippage in the 3 hours tested
- The pocket appeared to rest on the ears and weighed the head down on one side
- The head did not match the client's head-shape
- Revealed that this design was not ideal for the client

Design Study: Type of Metal Band

- The purpose of this design study was to determine what type of metal to make the headband portion out of: aluminum, iron, or copper
- Bent the metals to conform to the head-shapes, then maximum separation between the metal and the head after 24 hours
- Copper was least effective in keeping its shape, iron and aluminum were equally effective, but aluminum was more accessible in the correct lengths
- The study did not use the same heads for each metal or test other characteristics of the metals such as fatigue and elasticity

Design Study: Speaker Microphone Test

- Tested the quality and volume of various speakers and microphones to determine which would be used in the final prototype
- The first version of this study compared Pansonic headset to the ProHT multimedia headphones microphone and speaker
- The Panasonic speaker and microphone produced better results when used with Audacity but its microphone was too short
- Tested the Arama cell headset and found it did better than panasonic
- Provided qualitative and quantitative data for success but no way to keep the voice of the person testing at a constant volume

Table 1: Speakers and their functionality

Type of Speaker	Loudness (0-5)	Sound Quality (0-5)
ProHT Multimedia Headphones Speaker	1	2
Panasonic Comfort Fit Speaker	4	4
Arama Cell Phone Headset	5	5

Table 2: Microphones and their functionality

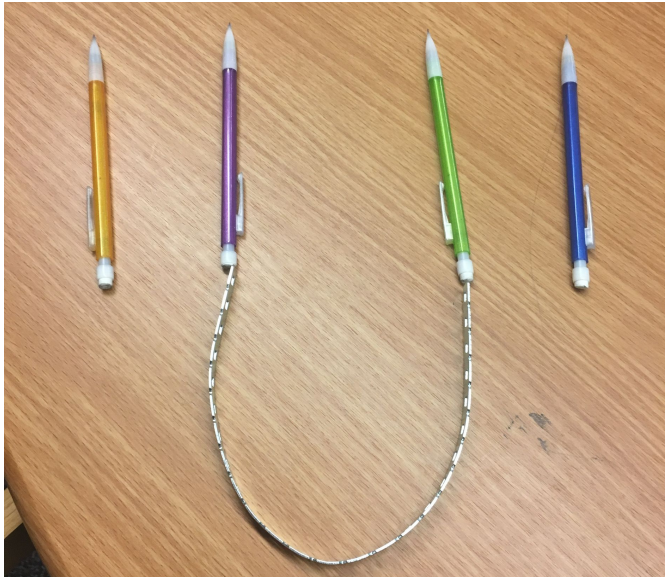
Piece of Hardware	Amplitude of Sound Recording (0-5)	Quality of recording on playback (0-5)
ProHT Multimedia Headphones Microphone	1	0
Panasonic Comfort Fit Microphone	3	3
Arama Cell Phone Headset	5	5

Design Study: Fatigue Tests

- Tested the quality of the metal band to be used on the top of the headset
- One test was completed by fastening a full water bottle to one end of the metal and holding it horizontally on a table with the water bottle end hanging off the edge
- The water bottle was dropped and the metal was bent downwards.
- The metal was flipped over so that the bent end was sticking up and the water bottle was dropped again, bending the metal in the opposite direction.
- This was repeated 25 times and the metal was still very rigid and had not bent.

Design Study: Fatigue Tests Continued

- A second test was completed by counting the number of times the metal could be bent completely in half with both ends touching.
- The metal could be bent completely in half 16 times before snapping.
- A third test was completed by counting the number of times the metal could be stretched from a rounded position and repositioned again.
- The metal was stretched from position 1 to position 2 and back to position 1 50 times and the metal was still rigid.
- All three fatigue tests revealed that the metal strip chosen for the headband portion would be strong enough to support daily bending.



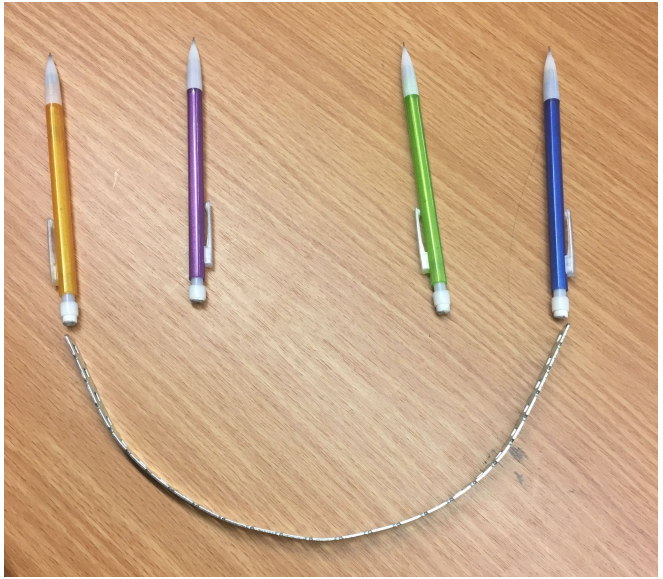


Figure : Third fatigue test: The metal was bent in a U shape

Figure : Third fatigue test: The metal was stretched to a wider U shape

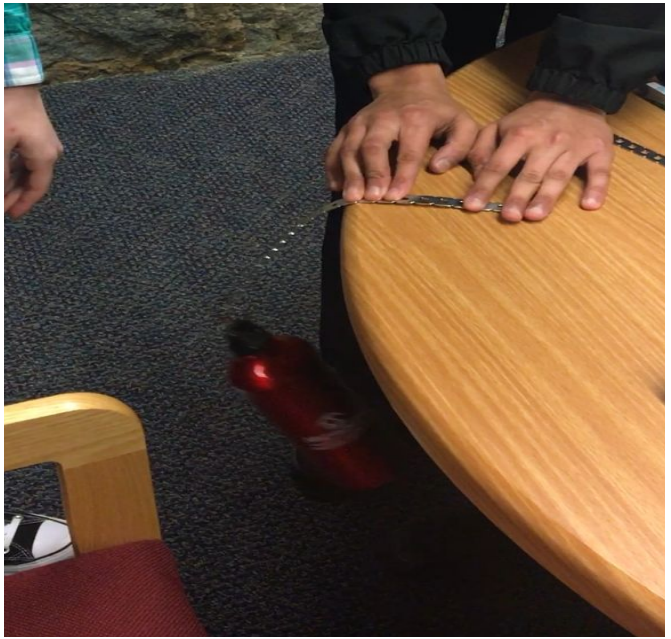
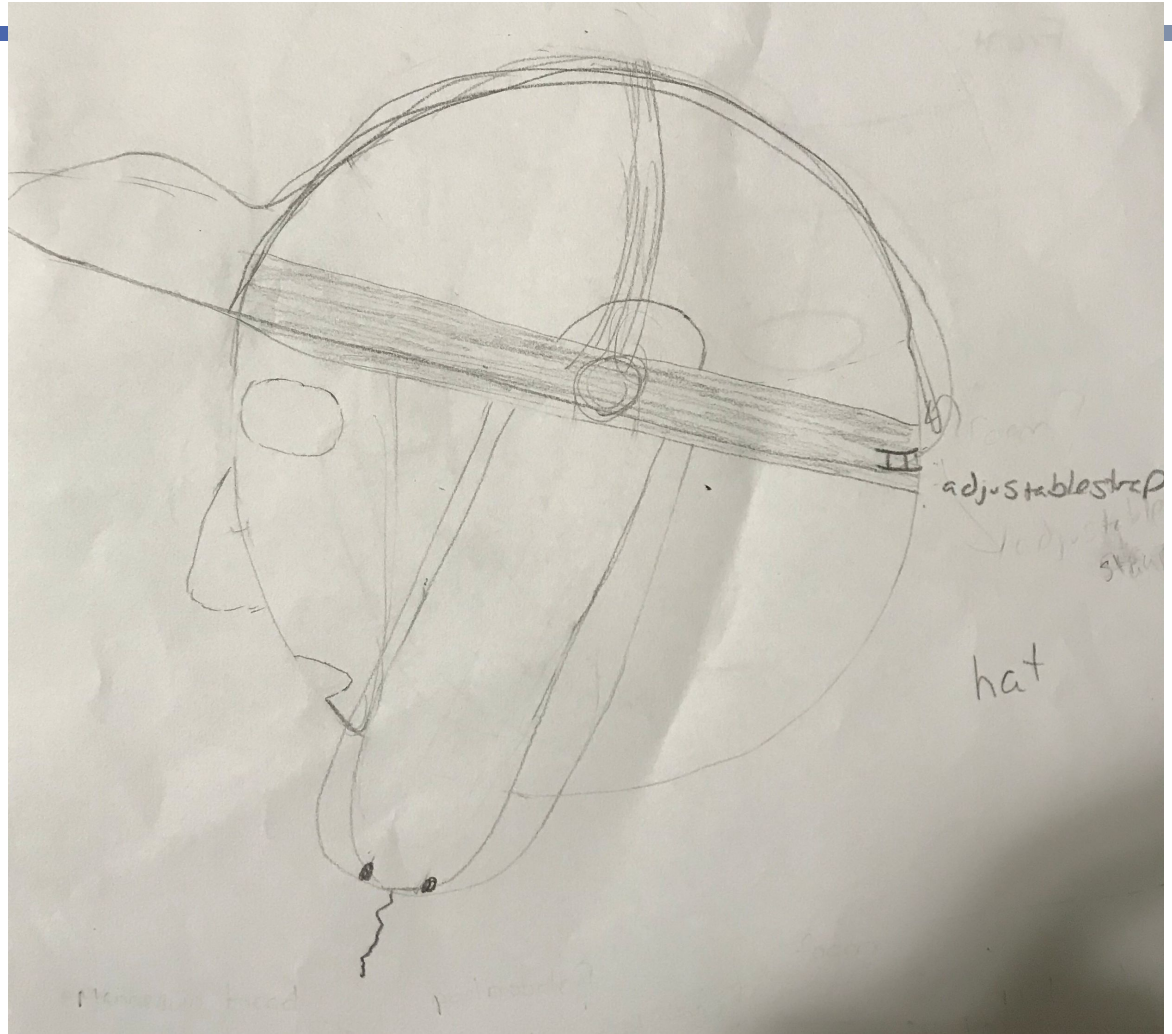


Figure : First fatigue test: Metal was held off the edge of a table

Figure : First fatigue test: Water bottle was dropped and the metal bent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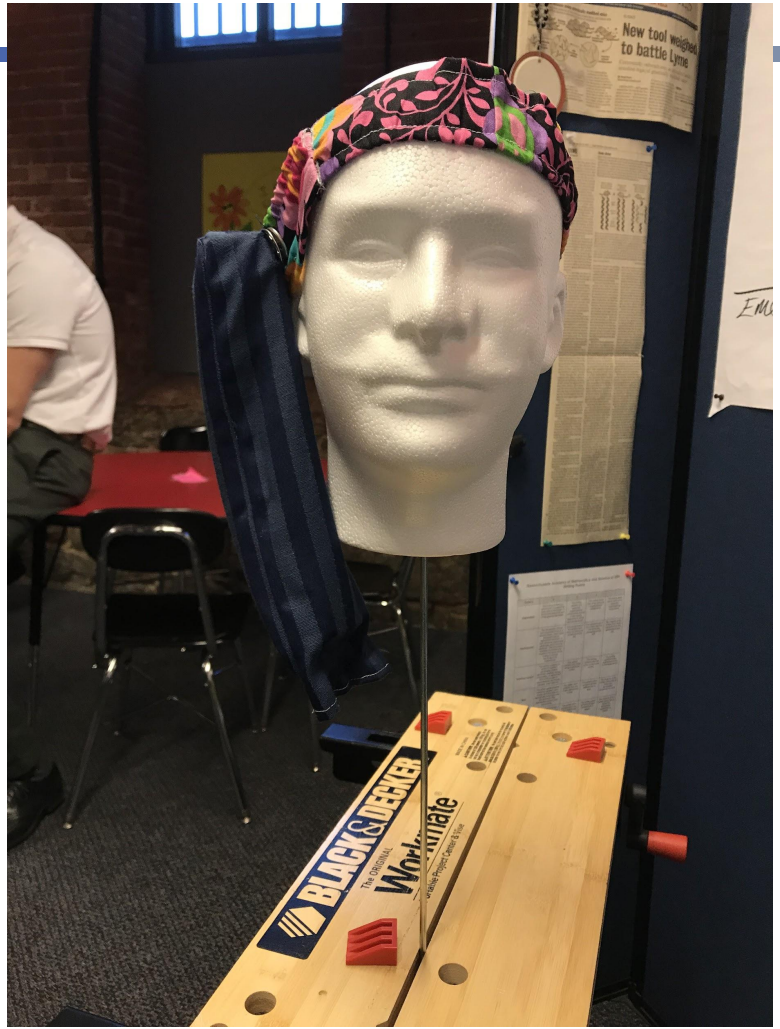
New tool weighed
to battle Lyme
BLACK+DECKER
Workmate

Figure : The iron piece on the plastic mannequin head after testing

Figure : The copper piece on the styrofoam head after testing

Figure : the aluminum piece on the papier mache head after testing