

Assistive Technology & Final Design Project:
The Strum Buddy

Introduction

Experiencing the limitations caused by the lack of appendages was entirely new to me, and as soon as I felt how restricted my movement was with taped fingers, I realized immediately how inconvenient many common practices could be. From tying back my hair to riding my bicycle, my daily activities started to seem impossible. The most glaringly insurmountable task was also the most important to me; with taped hands, there was no way I could play guitar.

After conducting the in-class tests using the computer, I went home and completely duct taped my right hand, which is my strumming hand. The main reason I did this is because the strumming hand can be used to fingerpick or can use a plectrum, while the non-dominant fret board hand uses individual fingers necessarily. After fully taping my strumming hand, it was no longer a strumming hand. Producing any clear tone out of the guitar was very difficult, so it was evident that I needed to find a way to hold a plectrum, as fingerpicking was entirely impossible.

Product Description

The Strum Buddy is meant to give disabled guitarists a way to reclaim their art. The Strum Buddy is an attachable holster for a range of standard guitar plectrums. It attaches seamlessly to the users fist, wrist, or forearm, depending on the severity of disability. It consists of a plate to which the plectrum is attached and a series of adjustable straps that are similar to those on wristwatches. Strum Buddy also sells a sock-like sleeve for the user's limb, though any sock or other arm covering would work with the Strum Buddy. This

product is designed for use by anyone missing appendages on their strumming hand, whether what is missing is a finger or two or the entire hand.

Product Requirements

The operation of the Strum Buddy is as follows: A sock-like sleeve is placed over the disabled limb such that any fingers the individual might have left are curled into a fist. The plectrum-holding plate is then placed over the sleeve on the inner side of the fist, wrist, or forearm depending on the user's disability. The plate is fastened in place using a series of adjustable straps and the plectrum is placed in the grips on the plate. Once tightened properly, the user can move their arm and or hand to manipulate the now stable plectrum. The plectrum can be rotated in the grip, so that it hits the strings at the user's desired angle.

The physical makeup is as follows: The sock-like sleeve that Strum Buddy sells is made of a soft cotton blend. This will help to minimize any physical abrasion to the skin that may be encountered during vigorous playing. The sleeve is approximately 18 inches long, which is based off of the average male elbow-to-fingertip length. This way, users can roll or cut the sleeve to their most comfortable size. The sleeve is available in a range of skin-tone colors.

The straps for the Strum Buddy will be interchangeable so that users can create a custom look for their apparatus. The default straps can be black or brown leather, but users can purchase nylon straps in other colors. The straps will be adjustable to fit as many different users as possible, and they will have notches similar to wristwatches. The straps are designed such that they may be long for some smaller users so that larger users can use it as well. If the straps are too long, they can be easily cut to size.

Lastly, the plectrum holding plate will be made of a stainless steel that is treated to be black. It will be circular and 3 inches in diameter. There are two main components to

this plate: the outer shell, which is what the straps are attached to, and the inner circle, which can be rotated within the inner shell and locked into place to adjust the angle of the plectrum. Additionally, the bottom of the plate is slightly padded to promote user comfort. To adjust the angle of rotation, release the lock button on the outer shell, turn the inner circle to the desired angle, and then relock the button. The inner circle will have two grips in the center for grasping the plectrum. They are adjustable to accommodate a range of different plectrum weights (thicknesses). To adjust the separation of the plates, or tighten the grip of the plates, use the screw on the inner circle to move one of the grip plates. Plectrums will be sold separately to encourage users to use their own favorite brands and easily integrate the Strum Buddy into the already existing market. All anthropomorphic data used for dimensioning came from *Introduction to Ergonomics* by R.S. Bridger.

Test Plan

To test the Strum Buddy, I would use a combination of self-report methods and readily observable measurements. For the observable measurements, I would focus on a few things, accuracy of notes, clarity of tone, and speed of playing. The difficult part of the observable measurements is that guitar proficiency varies dramatically between subjects, even if we control for years of practice and genre preference, for example. Therefore, we would need to use a within subject design, and the only way to do this would be to fake a hand disability, since anyone with a real disability would be unable to serve as their own corresponding non-disabled control. I would have each individual practice an unfamiliar song for half an hour before recording data. The control song and the experimental song would be approximately similar in difficulty and tempo. I would then record their accuracy by counting the number of mistakes they make, both in terms of notes and rhythm. I would evaluate the clarity of their tone by combining objective and subjective measurements. I

would use a Fourier analysis to analyze the waveforms of their playing to compare relative timbres and I would also request a subjective analysis of tone from the subject himself/herself. Lastly I would record the speed with which the subject played the piece and how much it varied from the prescribed tempo of the piece.

I think in addition to the collection of observable data, it is important to collect subjective data from the users. For the subjective portion of the data collection, I would utilize both disabled and non-disabled participants. I would ask open-ended but directed questions to try to allow users to imagine their ideal product and possibly shed light on better directions for my design. Some questions I might ask are: Did you feel comfortable using the Strum Buddy? Do you feel that with the Strum Buddy you were able to play like you used to with complete use of all of your appendages? Do you feel like the Strum Buddy felt natural enough to be enjoyable? Was the Strum Buddy easy enough to fit to your arm?

Using both the objective and subjective data, I think we would be able to tell whether or not the Strum Buddy is truly effective. For the objective data, ideally the control and experimental results would look similar, as we are trying our best to model what it is actually like to use a plectrum on a guitar. We would like to see as few mistakes, as little perturbation of tone, and as small a deviation from the prescribed tempo as possible. As for the subjective portion, any information would be useful. Ideally, users will respond positively and will be comfortable using the Strum Buddy. Even if there are suggestions for improvement, these suggestions could help us develop a newer and better version of the Strum Buddy.



