



RestBand

Brayden Popke

Sheridan College

Faculty of Craft and Design

Final Year Project (FYP) submitted to the school of Animation, Arts, and Design, Sheridan College in partial fulfillment of the requirements for a Bachelor of Craft and Design in Industrial Design

2022/2023

Advisor: Khalil Jamal

CONTENTS

01

Introduction

- 5 Problem
- 7 Definition
- 9 Background

02

Research

- 13 Market Research
- 15 Interviews
- 27 Findings

03

Synthesis

04

Brief

05

Concept Development

- 39 Ideation
- 41 Concept
- 43 Validation Model
- 45 Scale & Anthropometric Data
- 47 Fastening Method
- 51 Profile Details
- 53 Pull Tab
- 57 Wearable UX Interface
- 59 Companion Application

06

Final Concept

- 63 Restband wrist Monitor
- 67 Final Assembly
- 69 Dimensions
- 71 Materials & Specs
- 73 RestBand Application

07

Reflection

08

Bibliography



01

INTRODUCTION

Problem

Multiple Sclerosis can change an individual's life in various ways. For those living with MS, the effects and symptoms experienced vary widely from case to case presenting a unique design challenge that cannot be solved for everyone with one common solution.

Fatigue is one of the most common and debilitating symptoms for many MS-diagnosed persons and as such, I aim to design a product that helps manage their experience with it and provide them with more control and insight into their illness.

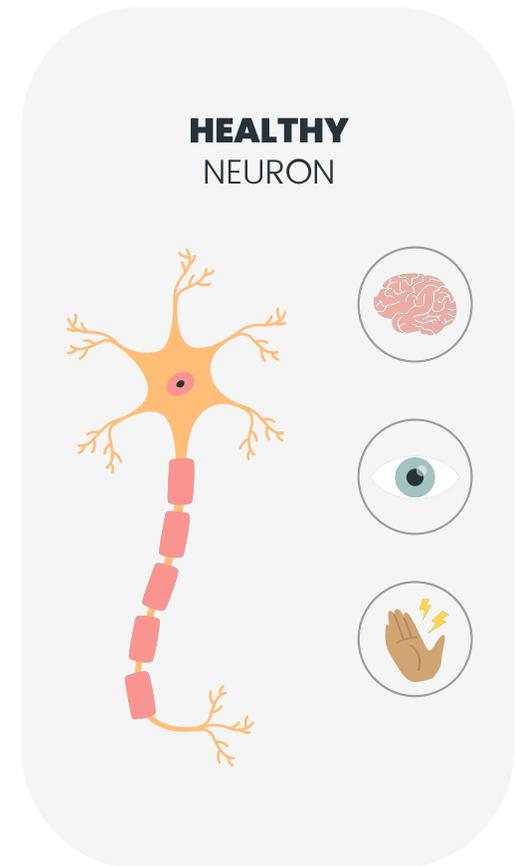


Fig. 2: Adobe Stock, Decision Making

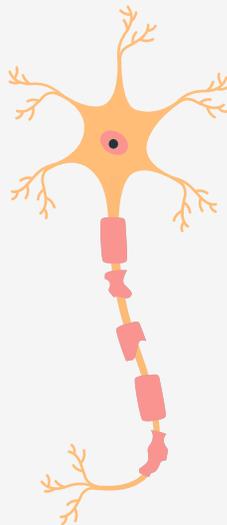
Definition

Multiple Sclerosis (MS) is a chronic autoimmune disease affecting the central nervous system of the body. With the nervous system's clear interaction with vital organs such as the brain and other parts like the spinal cord and optic nerve, MS often has a direct impact on memory, balance, mobility, and sight. With the severity and duration unique to everyone, so is the type of MS they are diagnosed with. Often referred to as an “episodic disability” MS-diagnosed individuals may go through relapses experiencing multiple or few symptoms but then feel slightly better in states of remission. MS is often seen more subtle around the time of the initial diagnosis classified as “progressive” where the severity will worsen over time rather than experiencing usual highs and lows.

As time goes on, what happens is the nervous system attacks the protective sheath that covers nerve



DAMAGED NEURON



fibres otherwise known as Myelin causing complications in sending and receiving communications from different areas of the body to the brain. This can start to take a toll on an individual and in most cases will leave some degree of permanent damage to the nerves.

MS is very unpredictable and can cause symptoms such as fatigue, vision complications, cognitive decline, lack of coordination, weakness, tingling sensations, mood changes, and in some cases bladder problems.

Much of what is seen in diagnosed individuals is physical but it can also manifest itself emotionally, and financially.

With no known cure to date, MS can make many feel left in the dark, but it is important to note that researchers are actively looking into the illness to learn more about it, how to better treat it, and how it can be eliminated in the future.

Background

Canada has one of the highest rates of MS worldwide with an estimated 90,000 diagnosed individuals. On average, 12 people will be diagnosed every day ranging from 20 to 49 years of age. With these numbers continuing to rise steadily, MS has become much more prevalent than ever before and as a result, is looked at with a higher degree of caution and concern than it has been in the past.

Like many other Canadians, I have a personal connection and place within these statistics with a close family member diagnosed in mid-2021 after difficulties with their vision which revealed lesions on the

brain. I decided to focus on Multiple Sclerosis to learn more about the illness itself but more importantly to create something that could be of benefit to people affected like the members in my family.

Multiple Sclerosis is something rapidly growing in scale and is an area of medicine that has not received the attention it deserves.

Symptoms may include



WALKING DIFFICULTIES



VISION PROBLEMS



WEAKNESS OR CLUMSINESS



FATIGUE



ABNORMAL SENSATION (e.g. tingling or numbness)



MOOD AND COGNITIVE CHANGES



PAIN

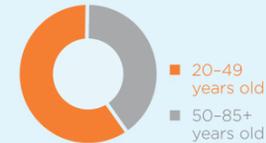
MS causes are not fully understood, but **GENETICS** combined with other factors related with **LIFESTYLE + ENVIRONMENT**, for example, may play a role.

New estimates (fiscal year 2014–2015) show that in **Canadians aged 20+**

Over **77,000** live with MS; almost **3/4** are women.



On average, **8 women + 3 men** are diagnosed with MS every day.



About **60%** of adults newly diagnosed with MS are **20-49 years old**.

Between 2003–2004 and 2014–2015

The proportion of Canadians living with MS increased by **1/3** but the rate of new cases did not increase.



Overall, Canadians with MS **live longer now than before**.



Fig. 3: Government of Canada, Multiple Sclerosis in Canada

A large, faint, light gray illustration of a neuron with a central cell body and several branching processes, serving as a background for the text.

02

RESEARCH

Market Research

Fatigue is widely experienced by diagnosed individuals but is a rather difficult symptom to design a product around to assist with and is impossible to fix or eliminate. For those reasons when looking at the market for products designed around anything to do with fatigue, the options available are severely limited and do not deal with MS or any chronic disease specifically.

Any assistive products available are seen with privacy furniture, digital applications to help plan and schedule, and fitness trackers. Each of these directions can help assist with general fatigue but do not cater to the many specific needs of an individual with MS or similar and are instead more directed toward the average individual with no underlying illnesses.



Privacy Furniture

Digital Schedule

Fitness Tracker

Fig. 4: Azure, Opus
Fig. 5: Mac Stories, Todoist
Fig. 6: El Camino Health, Health Tech Devices

Interviews

To get to know Multiple Sclerosis more and better understand potential areas of interest in terms of product development, I needed to interview a large catalogue of individuals diagnosed at a variety of different phases of the disease. This would provide a chance to gain a broader understanding and think in ways that could apply to more than just one type of individual with MS thus creating a much more usable product in the end.



Fig. 7: Adobe Stock, Candidate

Interview 1

Diagnosed Individual - Age 32 / Works Full Time / Diagnosed at 31

This interview helped provide more insight into how it feels to live with MS and what that can look like for someone diagnosed at an earlier time in their lives. He gave me input on how he arranges his life around the prominent symptoms of Fatigue, and how he copes with it when it is at its worse. He makes note of his cognitive function explaining it hasn't gotten worse, but it can take some time to process details

“it’s like you’re wearing a weighted blanket while trying to walk through sand after taking a bunch of melatonin”

“Just know that whenever you see us out and about, you’re seeing us at our absolute best and it took a lot to be where we are”

Interview 2

Diagnosed Individual - Age 24 / Works Full Time / Diagnosed at 22

This interview humbled me.

After speaking to this individual with MS in their 20s, I got the response anyone would expect of someone so young, which was by taking things in stride.

He mentioned that fatigue can get in the way of doing things he was used to doing all the time in the past but when asked what he does to cope with such an issue, he talked about simply powering through it.

“I work from home once a week and that is my favorite time”

“I have a short attention span and difficulty sticking to plans I made because I am so forgetful. It sometimes leads to conflict and it’s very frustrating”

Interview 3

Diagnosed Individual - Age 62 / On Disability / Diagnosed at 59

In speaking with this person, I gained insight into the fear of loss of mobility and how important it is for many. She mentioned that breaks in the day are beneficial but preferable in a public space. Her memory has taken a toll as she cannot recall as many small details but combats this with the use of planners. Due to her condition, she had to leave her place of work which was a big adjustment.

“My life is in a strange unknown”

“It is what it is. I’m not going to beat myself up for something I can’t control”

Interview 4

Diagnosed Individual - Age 44 / Works Part Time / Diagnosed at 37

In this interview, I spoke with a woman who started out with vision problems and numbness which led to her diagnosis. Although these things resolved themselves, one thing that has lingered on is fatigue. Like others, she found herself limiting her working hours and paces herself. Breaks are necessary which include isolation from others. She also notes that temperature has a big impact.

“I have had to learn how to pace myself because if I do too much on one day, then the next day I have to spend the whole time resting”

“Taking breaks throughout the day is essential. I often will take time after getting home from work each day to just sit and read as I find that very relaxing”

Interview 5

Diagnosed Individual - Age 62 / Works Full Time

Talking with this individual helped me realize the need for something to help aid with MS but also helps people look past the disability. He told me about his past adventurous lifestyle and how his condition robbed him of that as he is now wheelchair bound. Fatigue is experienced often but he has a difficult time giving into it as he is an active family man that doesn't want to miss a moment.

"Naps really interrupt my ability to be a present parent to my kids and active partner to my wife"

"Can you create something that helps people be radically open to others despite assumed challenges?"

Interview 6

Diagnosed Individual - Age 42 / Works Full Time

In this interview I spoke with a woman who hasn't sought out any kind of medical or natural treatment for her condition. She mentioned her difficulties with fatigue and that it can be "annoying" at times but that she moves forward despite the fact. She also pointed out that this method of "powering through" may work in the moment but will always catch up to her by the end of the day.

"The fatigue can be annoying; like I'm trying to walk around with a weighted blanket on"

"The brain fog makes me the most frustrated at times. On its worse days I have lost my focus and "forgot what I was doing" in the middle of doing the thing."

Interview 7

Diagnosed Individual - Works Full Time

This individual shared similar views from other interviews I had conducted where fatigue was very present and had a way of slowing them down in almost every way. One thing she let me know however was with her change in diet and lifestyle that helped decrease the effects it had on her and her memory. Keeping a planner nearby is also something that made her condition manageable .

“When I was in that flare with massive fatigue, I was slower at everything and was so tired”

Interview 8

Diagnosed Individual - Works Part Time

In this interview, I learned the importance of temperature regulation and the effect it can have on an individual. He is very reactive to temperature, and in hot environments, fatigue comes alive and makes many aspects difficult for him. Organization is also key as he notes keeping his area and paths in his home clean and clutter free help in conserving energy.

“Fatigue has disturbed every aspect of my life”

“The fatigue makes your limbs heavy so even combing your hair for example is difficult or sometimes impossible to hold my arm in place”

Interview 9

Diagnosed Individual - Age 49 / On Disability / Diagnosed at 47

Speaking with this woman pointed out the importance of conserving energy and how that can change the trajectory of your day. Fatigue has a big impact on her turning simple tasks that usually last an hour, into a few weeks. When walking, she uses poles to use less energy and muscles to stabilize herself, which helps in retaining energy for use later in the day.

“I didn’t realize how much energy I was spending not falling over or running into things”

“My son plays a lot of sports and has had a couple of concussions. I always told him, “Remember, the thing that tells you are injured is injured.”- I didn’t fully appreciate that until it happened to me”

Interview 10

Diagnosed Individual - Works Full Time

This interview highlighted the power of exercise and how it can benefit more areas than we think. Fatigue and memory problems are common for him, however regular activity has helped with this and now lives with very minor effects. One thing that still stands true however is the need for breaks often.

“I constantly forget things that I just know I must remember. Basic, simple things: technical terms, names of celebrities I like. I also twist words sometimes when I speak, letters just replace themselves”

Findings

Through my conducted research and interviews, I have deduced that there is an increased need and demand for more catered solutions and products on the market but also for more understanding of Multiple Sclerosis in and of itself. The lack of products on the market regarding common symptoms such as fatigue is a direct correlation to the lack of understanding from people on the outside looking in. While conducting my interviews, it became

clear early on that fatigue and Cognitive impairment were both pressing issues. However, Fatigue was arguably the most common one with over 80% of diagnosed individuals affected by it in some way or another. This information retrieved along with the positive feedback from interviewees when asked about the topic helped back and validate my intentions and approach for this project.



03

SYNTHESIS



Insights

There is a lack of attainable solutions to provide relief regarding many symptoms MS-diagnosed individuals experience, especially pertaining to fatigue.

There is a need for a product that better assists individuals in managing their energy levels and avoiding exerting too much unnecessarily while doing day-to-day tasks at work or home that could alter their presence in other areas of life.

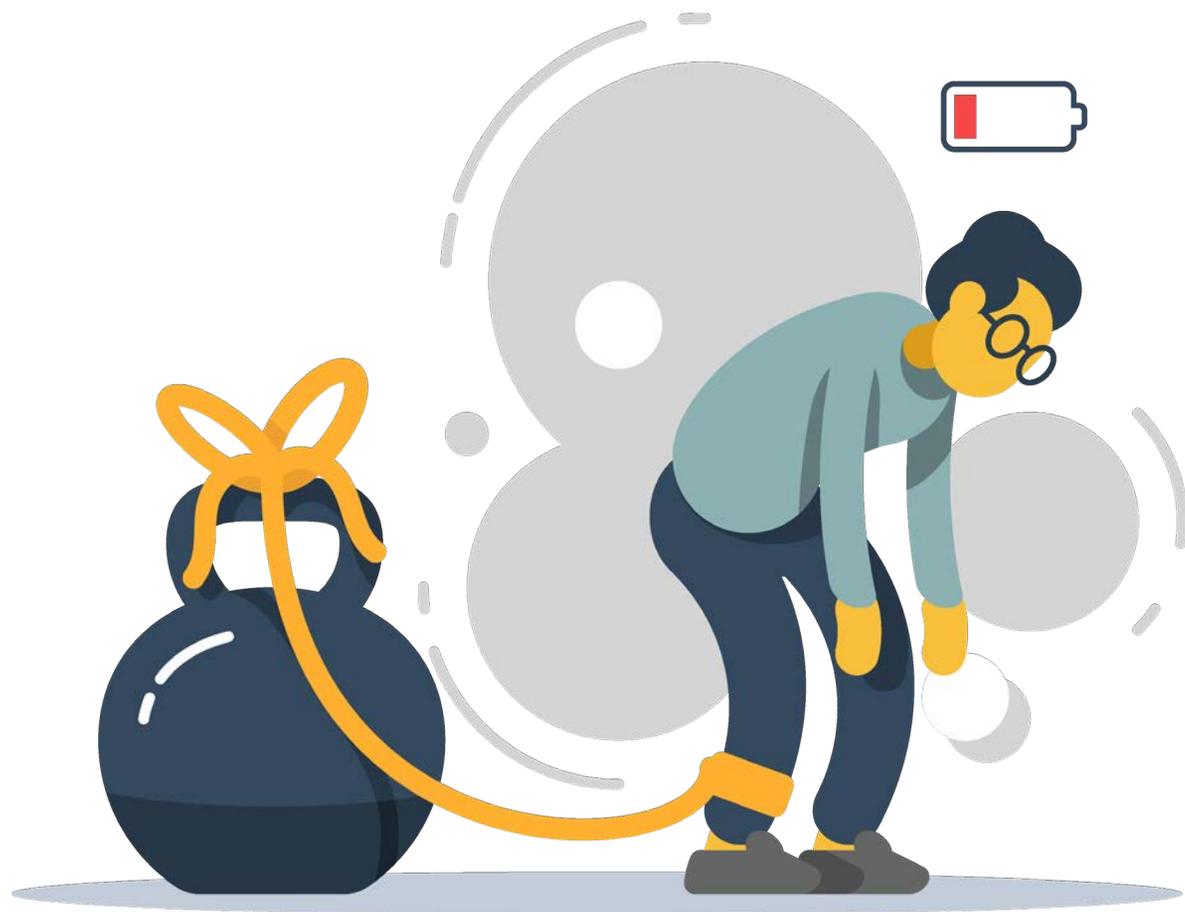


Fig. 8: Adobe Stock, Chronic Tired



04

BRIEF

To directly respond to the symptom of Fatigue in those with Multiple Sclerosis (MS) from 20 to 60 years of age, and mitigate its effects with a product designed around managing and regulating energy levels throughout the day while performing tasks at home or work.

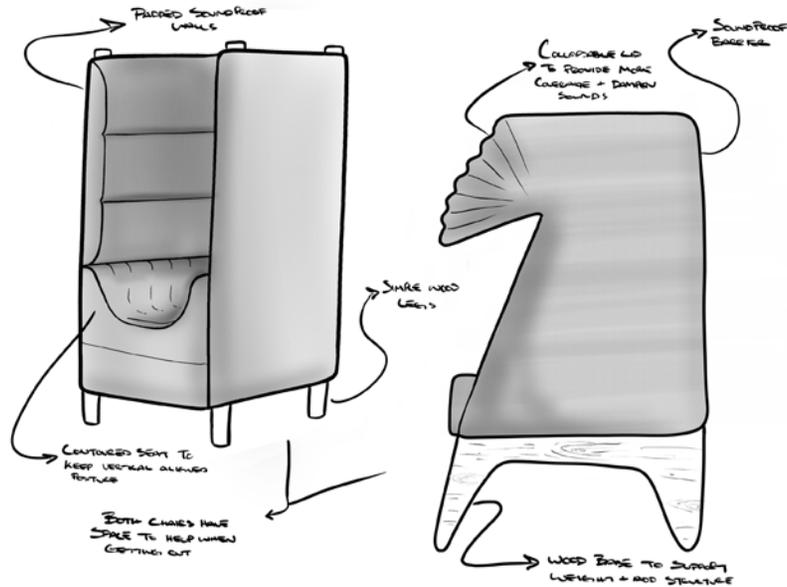
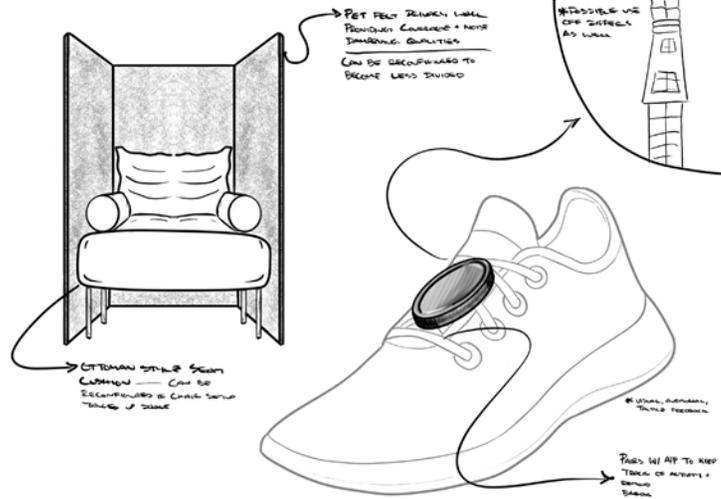
The background features a stylized neuron in light gray, with a central cell body and several branching processes. A solid yellow vertical bar is positioned on the far left side of the image.

05

CONCEPT DEVELOPMENT



Ideation



- * MOBILE DIVIDER** THIS PROVIDES PRIVACY AND SOUND DAMPENING QUALITIES SUITABLE FOR HOME + OFFICE USE
- * MODULAR + LOCK TOGETHER** TO CREAT A SEPERATED SPACE
- * CONTAINS Pockets** TO PLACE ITEMS PERSONAL / OTHER — DON'T LOSE TRACK
- * COME IN VARIOUS HEIGHTS** TO CHANGE LEVEL OF INTERACTION — MORE CLOSED OFF OR OPEN



→ ILLUMINATES TO INDICATE ONGOING TASK / VISUAL REMINDER / CUE
 — AIDS IN PLANNING, PACKING, CONSERVING ENERGY

* EACH ROOM IN HOUSE WOULD HAVE ONE OF THESE DEVICES

* PAIRED + CONTROLLED W/ AN APP

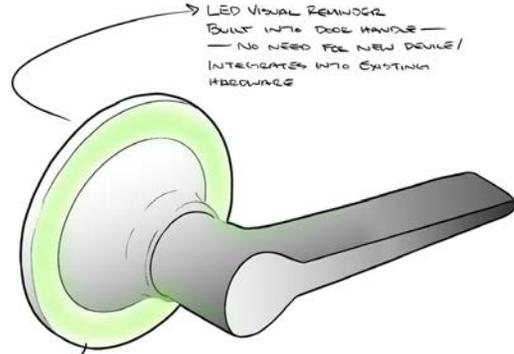
→ MADE W/ CLEAR MATERIAL TO CATCH LIGHT + DRAW ATTENTION



* PALM SIZED DEVICE
 → ILLUMINATES - COULD ALSO HAVE AUDITORY / TACTILE FEEDBACK

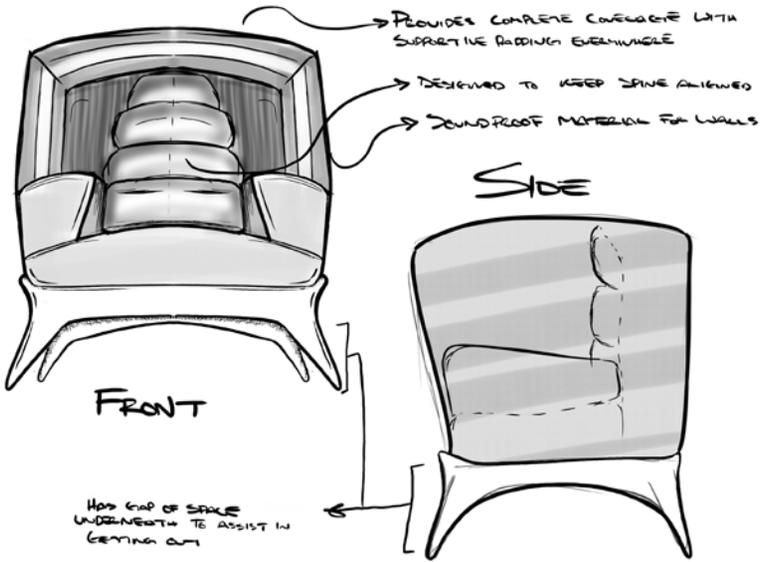
* GOAL IS TO ASSIST IN EVERYDAY TASKS TO HELP KEEP THINGS IN ORDER + TAKE STRAIN OFF USER MENTALLY
 ALSO ASSIST W/ COGNITIVE ASSETS

* PLANNERS + REMINDERS OFTEN USED BY INDIVIDUALS WITH MS ON PHONES TO KEEP TRACK — MANY STILL FORGET + NEED A CLEARER VISUAL INDICATOR MORE PERMANENT



→ LED VISUAL REMINDER BUILT INTO DOOR HANDLE — NO NEED FOR NEW DEVICE / INTEGRATES INTO EXISTING HARDWARE

→ LED WILL ILLUMINATE TO SIGNIFY A ROOM WHERE THE USER HAS A SCHEDULED TASK
 SOFT GREEN GLOW WOULD BE STRAINING ENOUGH TO SEE WHILE STANDING AROUND BUT COULD BE A HARDER WHITE LIGHT



→ PROVIDES COMPLETE COVERAGE WITH SUPPORTIVE PADDING EVERYWHERE

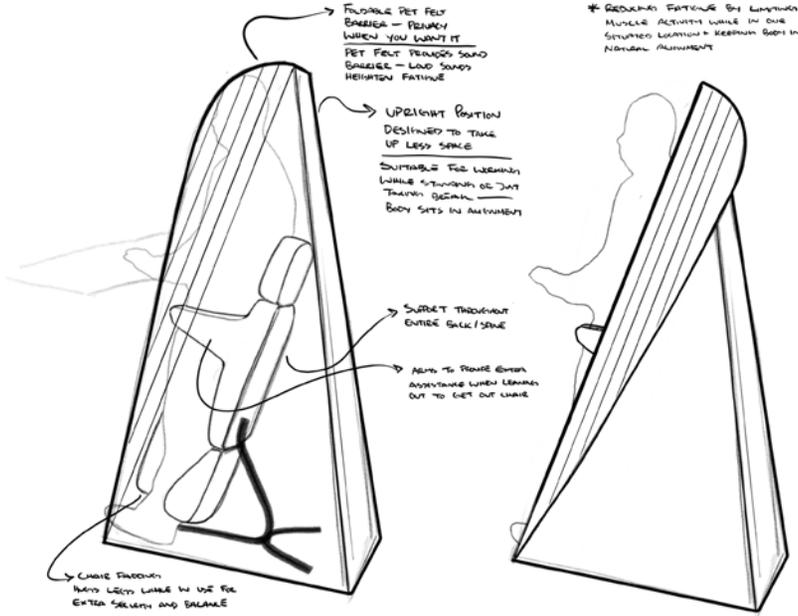
→ DESIGNED TO KEEP SPINE ALIGNED

→ SOUNDPROOF MATERIAL FOR WALLS

SIDE

FRONT

→ HAS GAP OF SPACE UNDERNEATH TO ASSIST IN GETTING OUT



→ FOLDABLE PET FELT ENERGY — PENNY WHEN YOU WANT IT
 PET FELT PROVIDES SOUND ENERGY — LOUD SOUNDS HEIGHTEN FATIGUE

→ UPRIGHT POSITION DESIGNED TO TAKE UP LESS SPACE
 SUITABLE FOR WORKING WHILE STANDING OR JUST THINKING ABOUT IT
 BODY SITS IN AIRFLOW

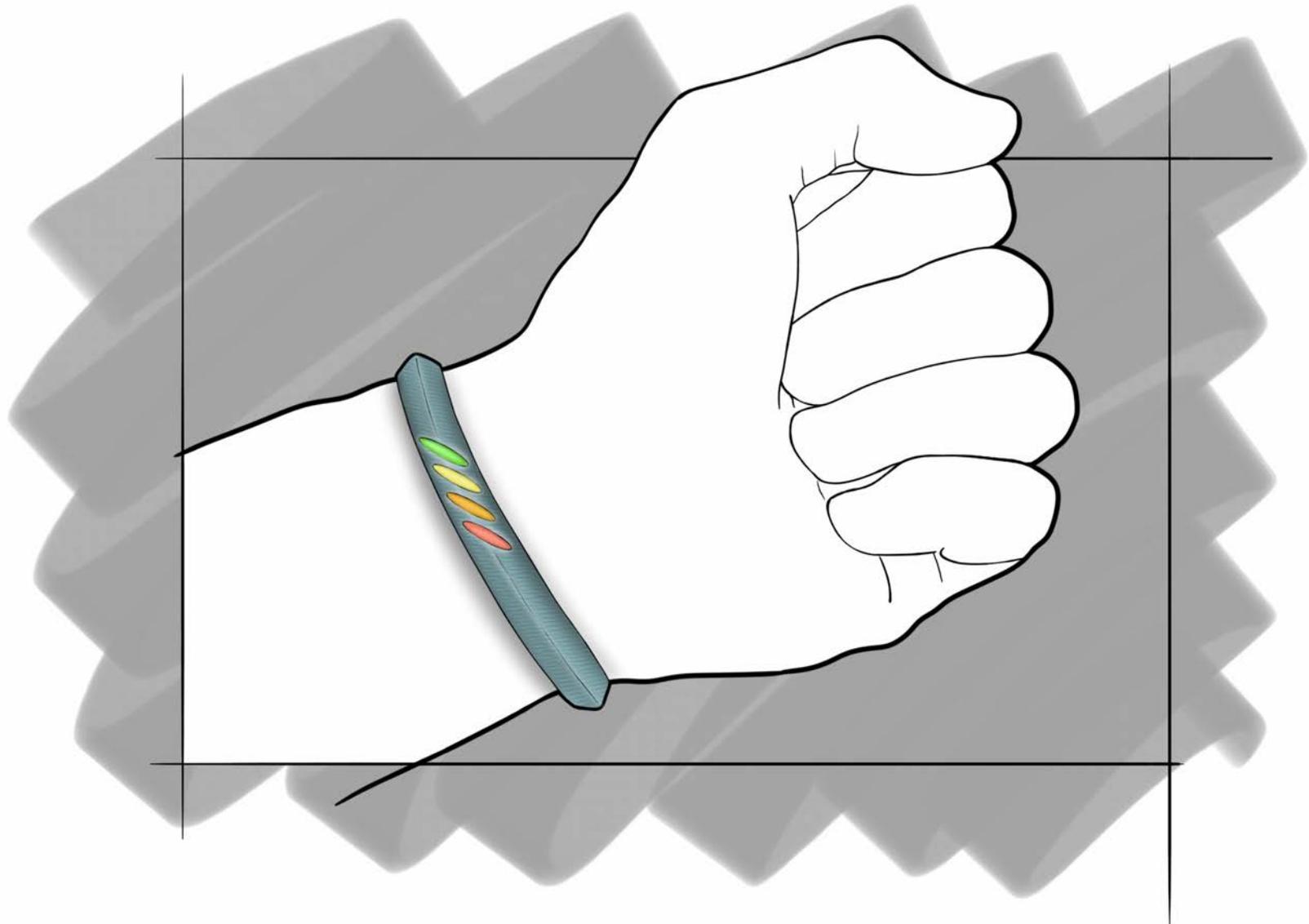
→ SUPPORT THROUGHOUT ENTIRE BACK / SPINE

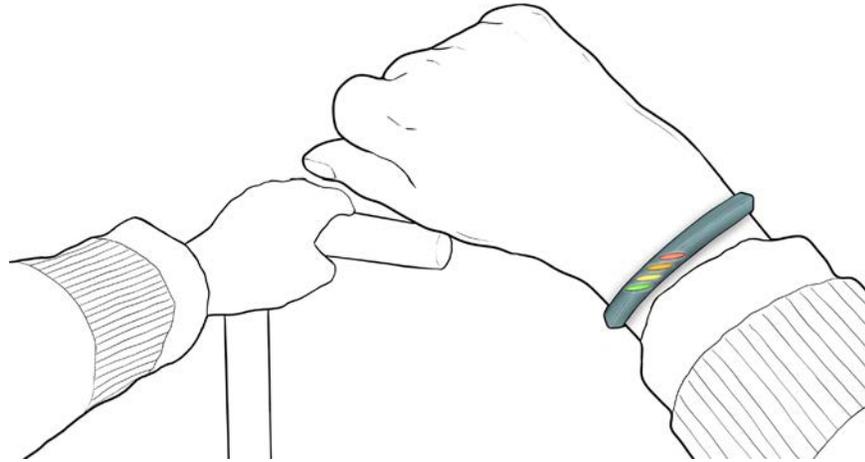
→ AIMS TO PROMOTE BETTER ADJUSTING WHEN LEANING OUT TO GET OUT CHAIR

→ CHAIR STRUCTURE HAS LEGS LOCKED IN USE FOR EXTRA SECURITY AND BALANCE

* REDUCING FATIGUE BY LIMITING MUSCLE ACTIVITY WHILE IN OUR SITUATED LOCATIONS + KEEPING BODY IN NEUTRAL ALIGNMENT

Concept





The Fatigue Journal is a wearable piece of technology created around monitoring and tracking stress levels throughout the day. Although there is no unit to measure fatigue, stress has been found to have a direct correlation to the effect of fatigue within those with MS and in general. With a physical product that allows for this kind of tracking and alerting when levels get too high, this concept is suitable for those who aren't as technically inclined with a ready out of box experience however, optional features are included when paired with an application for more personal and in-depth tracking or monitoring. This would be a helpful tool for close friends, family, caretakers, or occupational therapists to have as a way to monitor and track patterns and trends within an individual to better assist them.

Validation Model

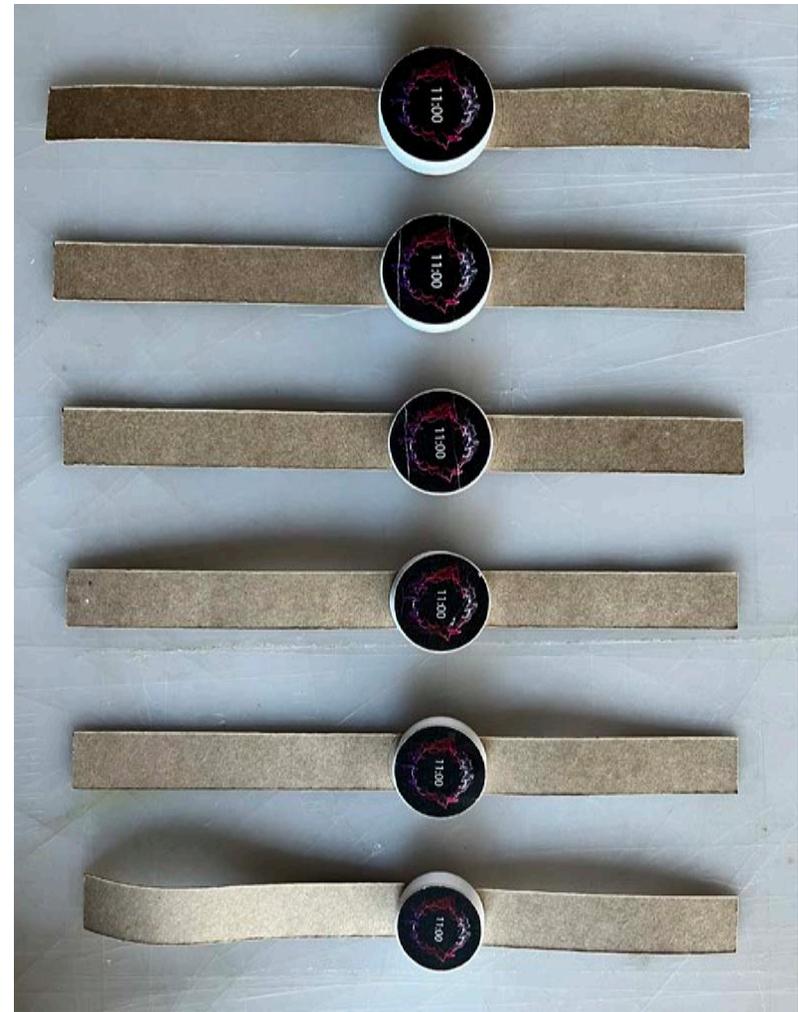
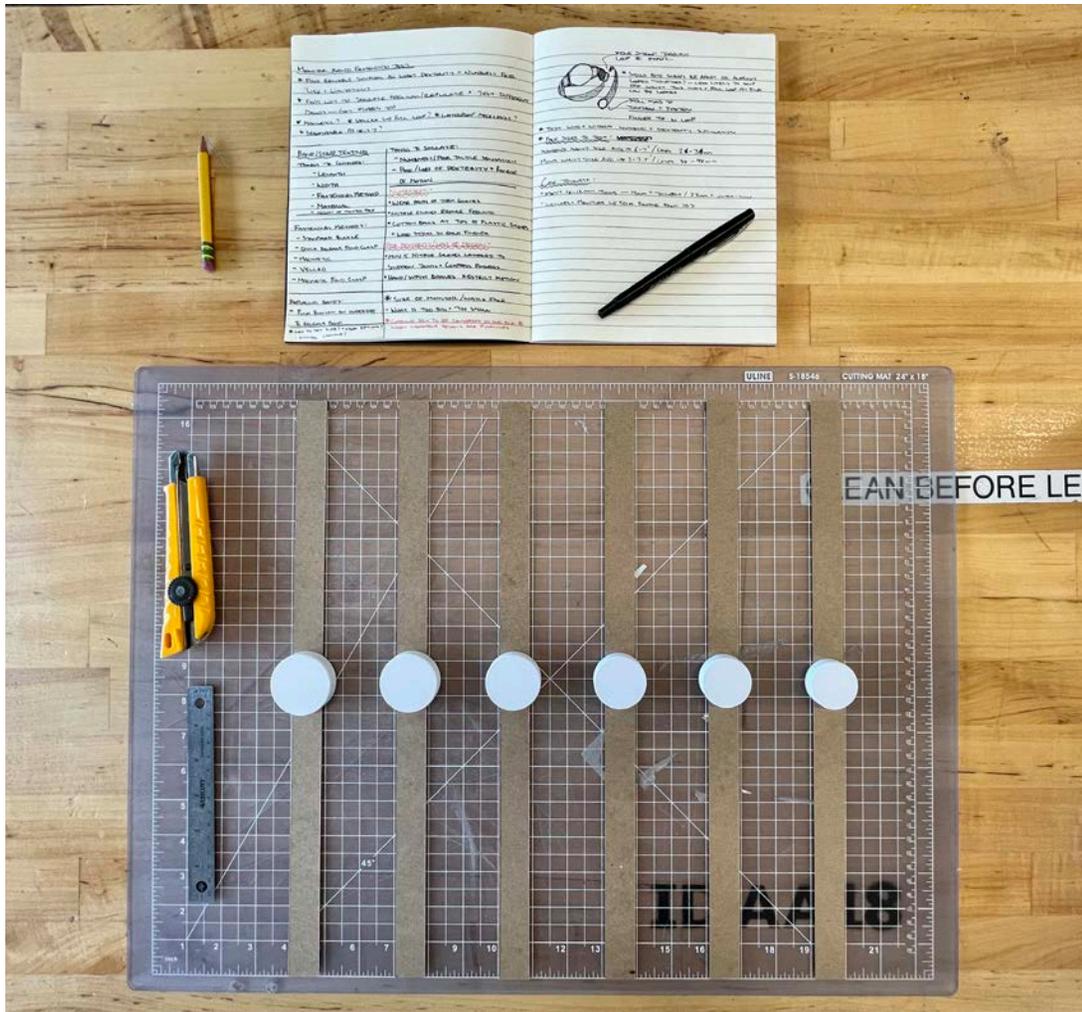
The Validation phase of this project was geared less towards finalizing material choices and small mechanical details and more towards helping push the overall concept to evolve and take shape. With a topic initially so broad at times it was rather difficult narrowing in on one set

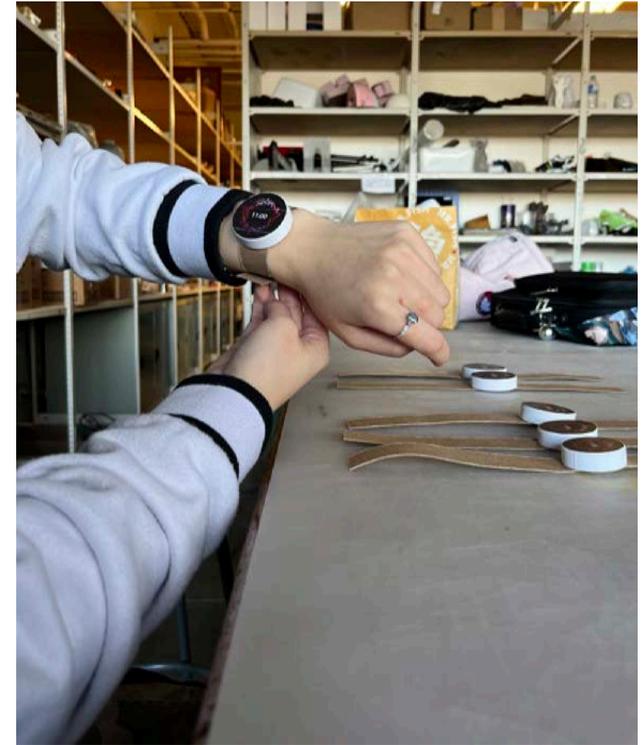
direction. Making rough concept models helped find the footings of the project and although not very much progress was made physically, it could not have gone further and evolved the way it did. This was the biggest stepping stone of the semester.



Validation model showing a proof of concept for the fastening mechanism, a rendered view, and companion application concept

Scale & Anthropometric Data





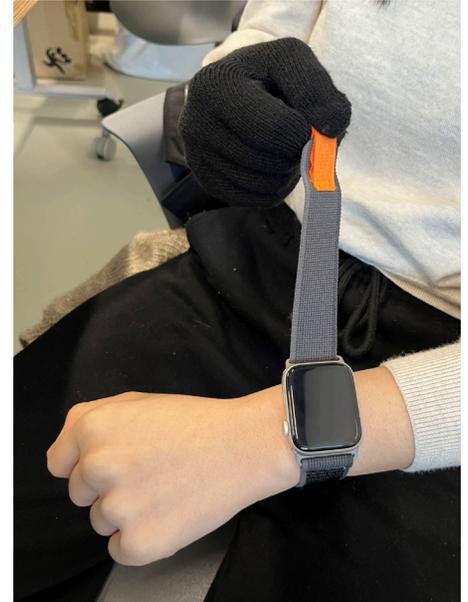
To make well-informed and justified decisions, many studies and tests were carried out to ensure all aspects had been considered to reach an informed and practical result for many different users. Such considerations included the size of the monitor face and overall footprint on the wrist, the monitor thickness, and screen size. These tests were made possible by 3D printing scale models of varying sizes, recording the wrist size of the volunteer, and finally looking at what suited their wrist in addition to their personal preference. This paired with data collected and published from online research archives helped create a solid foundation going forward for these different variables.

Fastening Method

One of the largest aspects to consider for RestBand was the method of fastening. Creating a mechanism which does not require a high degree of dexterity from the user or relies heavily on any fine motor skills was crucial to the overall success.

To determine the best method of fastening, simulations were run with multiple different volunteers where different fastening

methods were tested using tools such as gloves, and hand braces to simulate numbness in the hands, limited movement and poor dexterity. A total of 10 different fasteners were tested which allowed for the pros and cons to be gathered in the end and used towards creating something more tailored to the audience of RestBand.





<ul style="list-style-type: none"> • Difficult to keep in place • Tendency to pinch skin when tucked in • Needs a surface to help put on • Difficult to grip and guide small parts • Feels secure when on • Easy to take off 	<ul style="list-style-type: none"> • Stiff and difficult to maneuver • Separate straps hard to manipulate • Moves around a lot • Difficult to guide straps through free loops • Familiar mechanism 	<ul style="list-style-type: none"> • Hard to determine what strap goes on top • Does not tighten easily • Magnets often snap to other band making it tricky to fasten • Magnets too big and awkward - Creates rigid form on wrist • Stays on well 	<ul style="list-style-type: none"> • Tedious and complicated to adjust size • Weight makes it difficult to balance and fasten • Nice that bands are connected not separate sliding onto wrist • Easy to close shut with hand or on other surface 	<ul style="list-style-type: none"> • Flimsy/loose material hard to manipulate • Easy to fasten in any placement to other band • Difficult to grip magnetic tab to secure - Too small • Feels secure on wrist • Material is light and breathable • Strap slips out of loop when on wrist if not stable 	<ul style="list-style-type: none"> • Easy to slip onto wrist • Nice that bands are connected not separate sliding onto wrist • Adjusting is tricky • Easy to fasten and feels secure on wrist • Bands can get in the way on underside if wrists are smaller 	<ul style="list-style-type: none"> • Slips onto wrist easily • Easy to fasten • Easy to remove • Minimal movement when on and when fastening • Feels secure on wrist • Nice indication of tab to pull and band placement • Tendency to come out of loop when handling
<ul style="list-style-type: none"> • Hard to feel small parts to secure on • Need lap for stability • Awkward to handle and maneuver • Difficult to decipher different materials • Separate straps hard to manipulate • Easy to take off 	<ul style="list-style-type: none"> • Difficult to grip and feel small parts • Difficult to guide straps through buckle • More stable when strap goes through buckle - tricky to do • Separate straps hard to manipulate 	<ul style="list-style-type: none"> • Easy to get on but difficult to adjust afterwards • Poor grip • Comes together easily when bands meet • Easy to take off 	<ul style="list-style-type: none"> • Cannot feel buttons to remove from wrist • Nothing to grip - slips easy • Easy to close shut with hand or on other surface 	<ul style="list-style-type: none"> • Difficult to align magnetic tab to band • Hard to remove from wrist • Difficult to slide through loop with larger hands - Need to take apart to fit on wrist • Difficult to grip magnetic tab to secure - Too small 	<ul style="list-style-type: none"> • Cannot grip very well • Hard to leverage magnet fastener to remove • Easy to fasten and feels secure on wrist • Adjusting is tricky 	<ul style="list-style-type: none"> • Easy to fasten • Pull tab makes fastening easy to execute • Slightly more difficult for larger hands to slide into • Tendency to come out of loop when handling
<ul style="list-style-type: none"> • Need lap or surface for stability • Difficult to leverage • Separate straps hard to manipulate • Long time to put on • Some difficulties removing but not too bad 	<ul style="list-style-type: none"> • Difficult to guide straps through buckle • Bands fit tight in free loops when fastened - Can be difficult to remove without full range of motion or motor skills • Lots of resistance 	<ul style="list-style-type: none"> • Difficult to put on and maneuver without dexterity of thumb • Tendency to stick to itself • Hard to do unless on a surface • Hard to grip • Separate straps hard to manipulate 	<ul style="list-style-type: none"> • Hard to pinch buttons to remove • Easy to fasten on another surface - difficult to do by hand 	<ul style="list-style-type: none"> • Needs a surface to help put on • Difficult to pull magnetic tab off to remove • Difficult to maneuver • Easy to adjust if tab is in hand - otherwise difficult 	<ul style="list-style-type: none"> • Easy to fasten with limited movement and space • Adjusting is tricky 	<ul style="list-style-type: none"> • Pull tab helps to secure but can be hard to grip • Tendency to come out of loop when handling

Tested with Bare hands

Tested with gloves to simulate numbness and loss of feeling

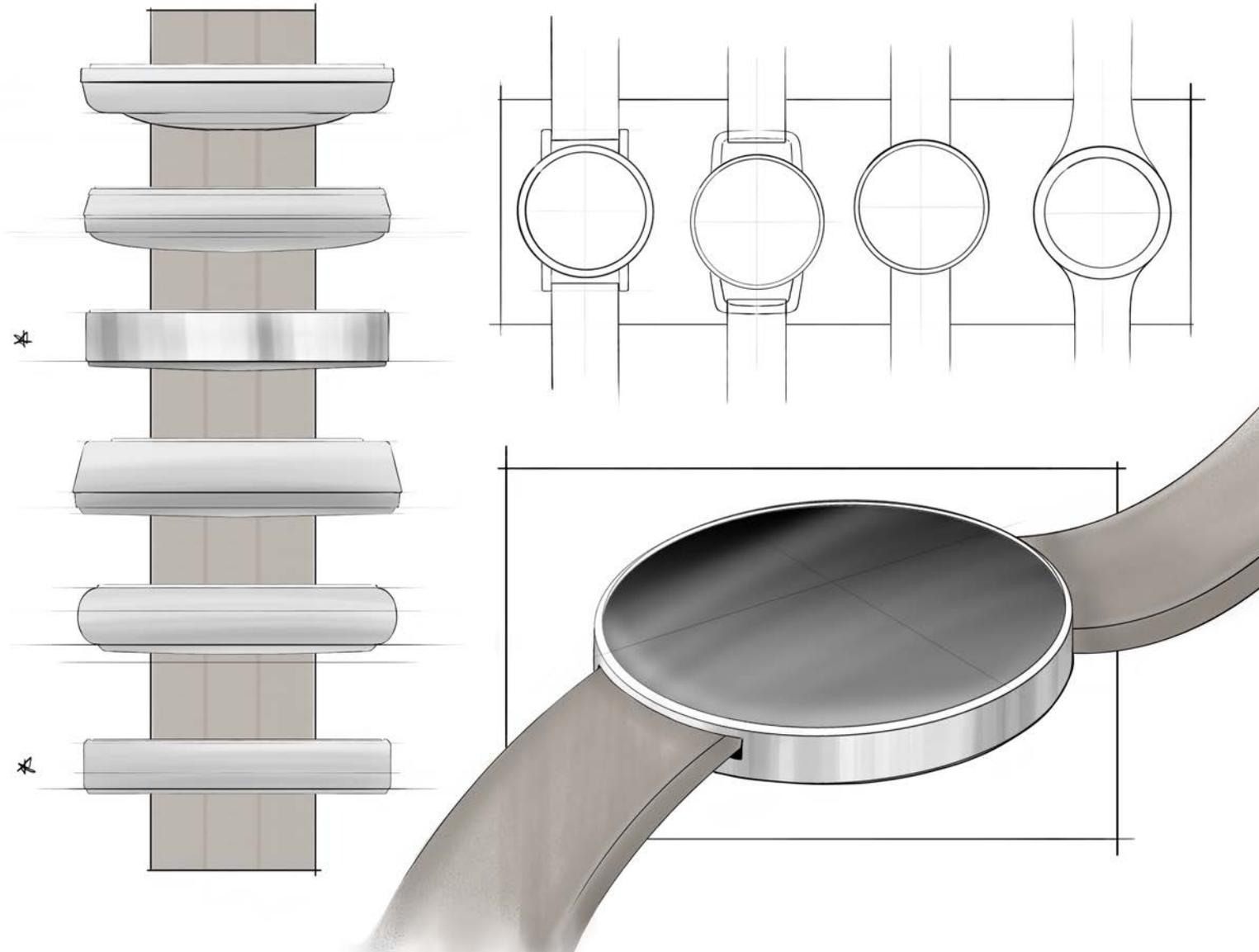
Tested with hand brace to simulate poor dexterity

Fastener Study Findings

Following the wristband fastener study, a lot was learned, some of which were expected and some that simply were not. It became obvious that anything to do with small parts and maneuvering was not a possibility for most and had to be eliminated as a contender. In the end, the simplest of mechanisms proved to be the most effective, those being magnets and Velcro. With the complexity of the placement of

magnets and their ability to wear out over time, the decision to use Velcro was made with some minor modifications to suit more of the user for RestBand than that of the average individual. Such modifications included a pull tab for more control and leverage when tightening, and free loops with less resistance when sliding along the band to make it easy for the user to put on and remove the wrist monitor.

Profile Details

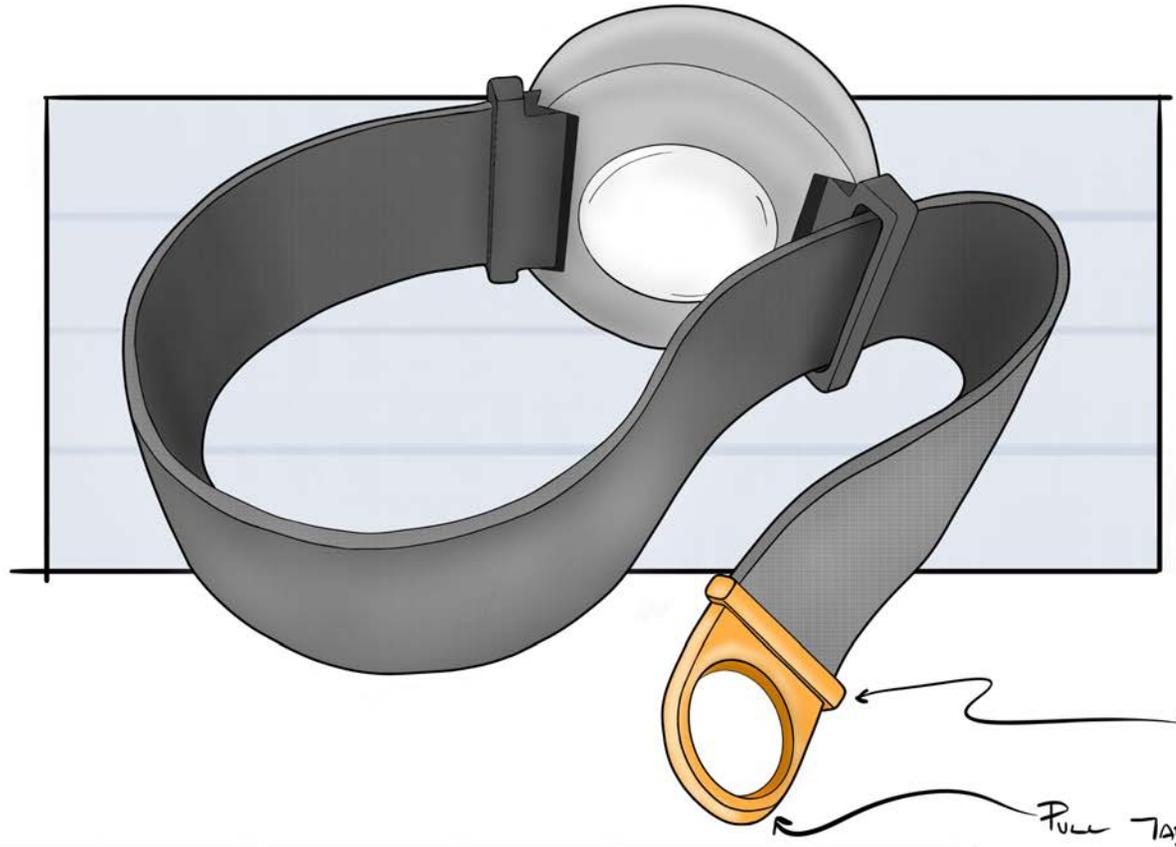




One of the final details to consider and most important was the form and profile of the monitor itself. With unlimited options to consider, it was important to find one that would provide adequate space for the kind of tech and internals needed to run such a device but also for easy handling by the user. Keeping in mind that many individuals with MS often have poor dexterity and in some cases numbness or loss of feeling in their hands, using a shape with some definition that lends itself to being picked up from a flat surface or moved while on the wrist was an important feature to think through.

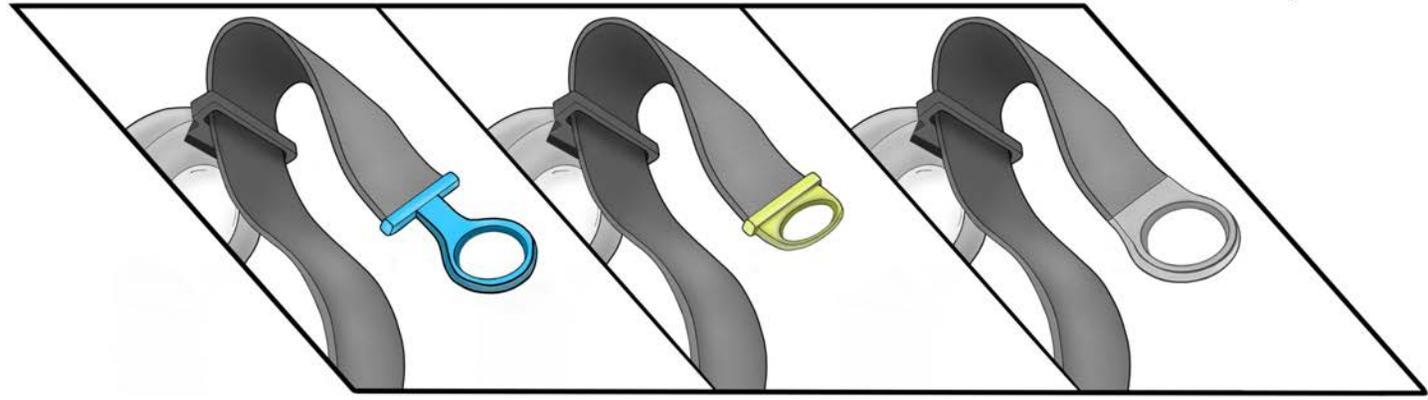
Pull Tab

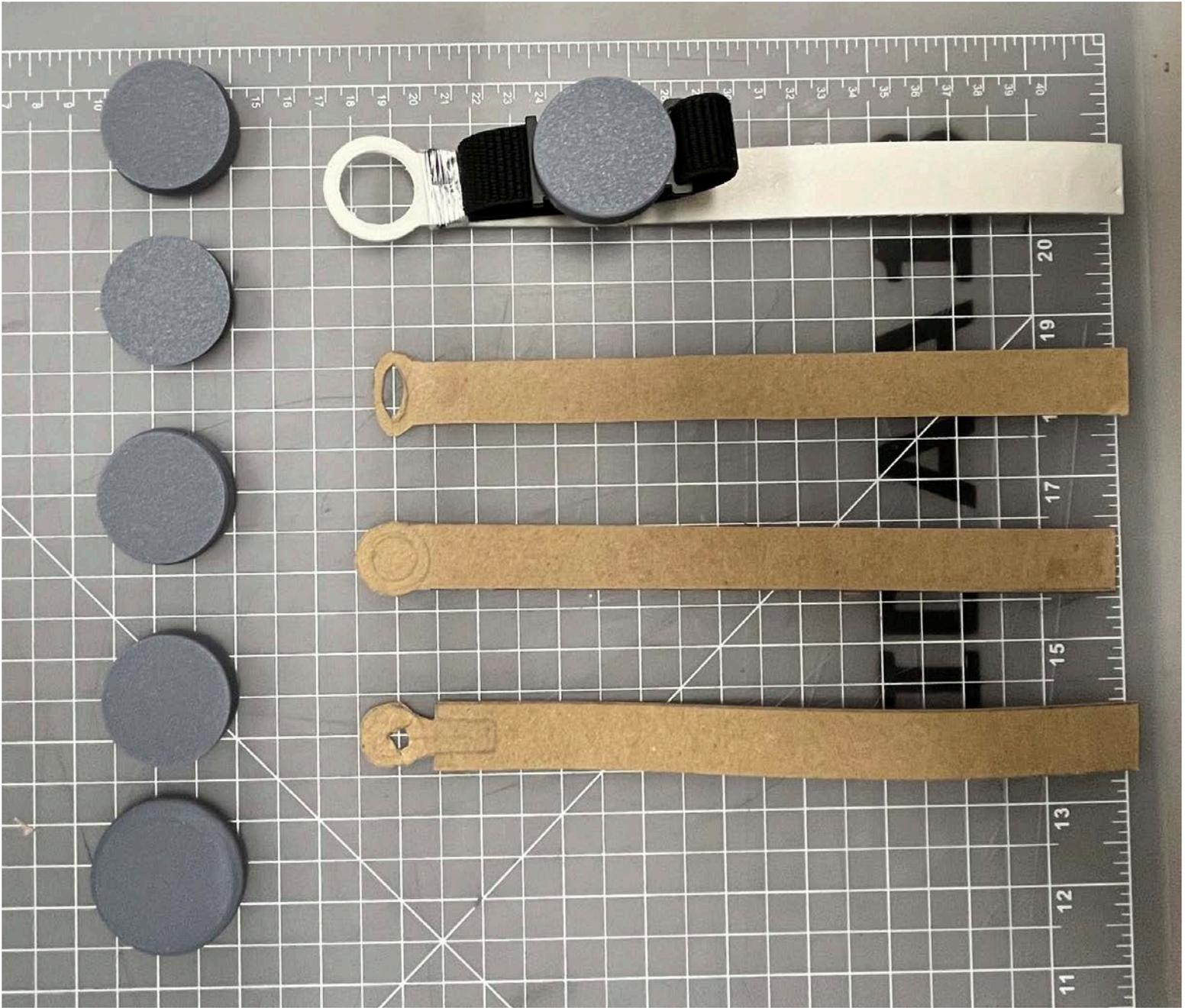
One of the biggest design decisions made with RestBand in terms of ease of use was with the included pull tab built off the wrist monitor wristband. Many forms and iterations were created and tested out to see what proved most functional for the user in terms of use but also for its footprint. Many versions were made but did not prove as useful due to the amount they stuck out making it more of a nuisance than an assistive feature.



BAR STOP

PULL TAB





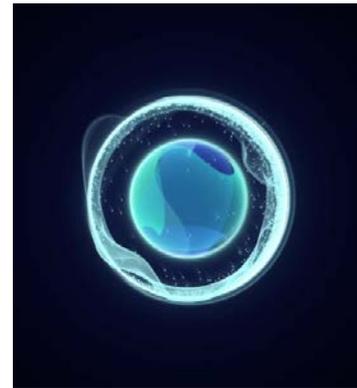
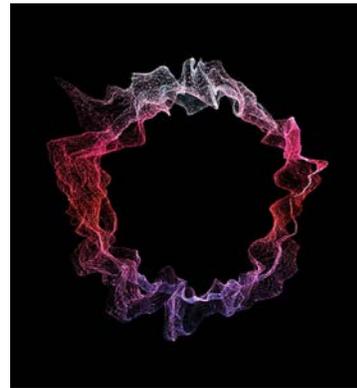


Wearable UX Interface

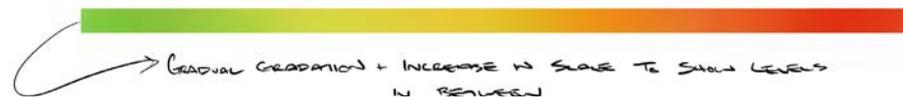
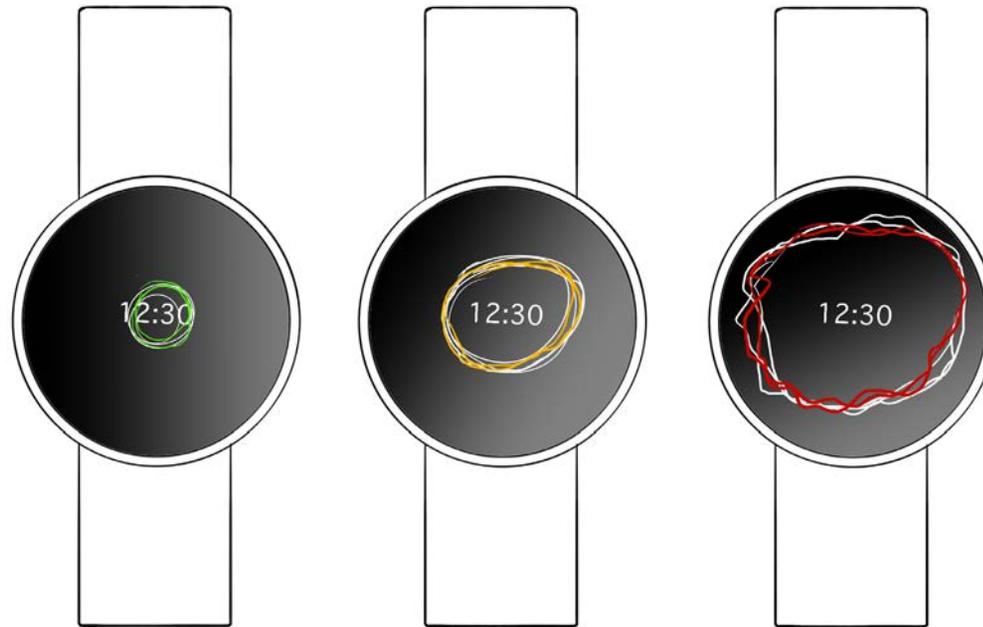
The primary purpose of RestBand is to track the user's stress and present that data through the wearable display.

Initially, that feedback was to be given visually through a coloured LED however, after further investigations and looking into other forms of tech available, it was

decided to take a much more subtle and friendly approach with an animation. This would be gradual and rather than only showing a few peak levels of stress the user experiences, it would be able to show all the levels as well as all the ones in between with its gradual progression.



*Some shapes that inspired RestBand's finalized animation

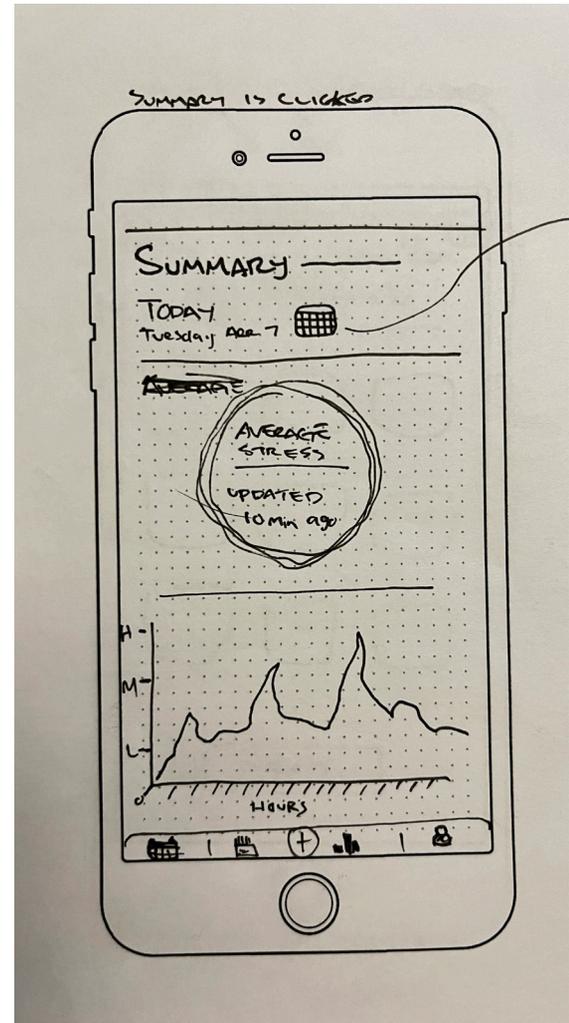
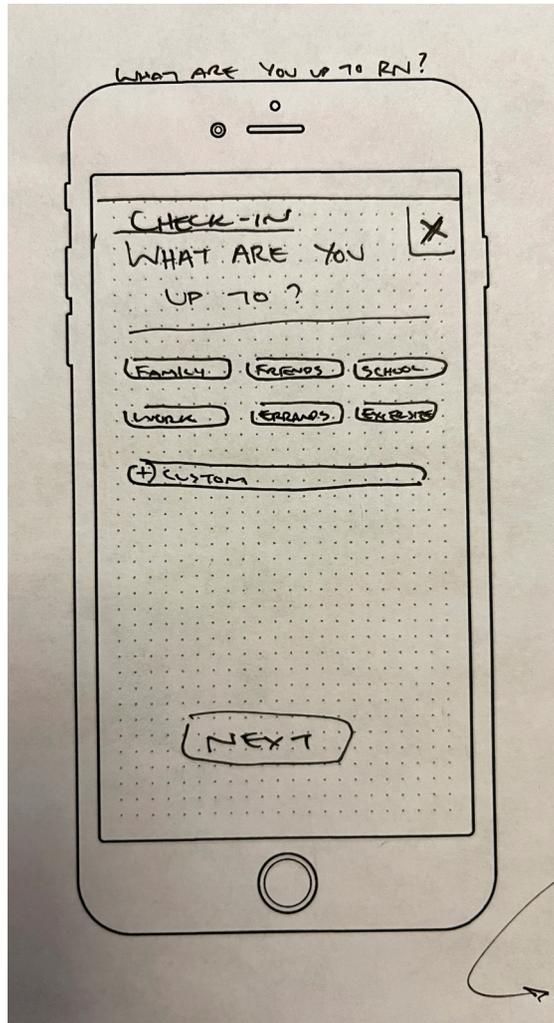
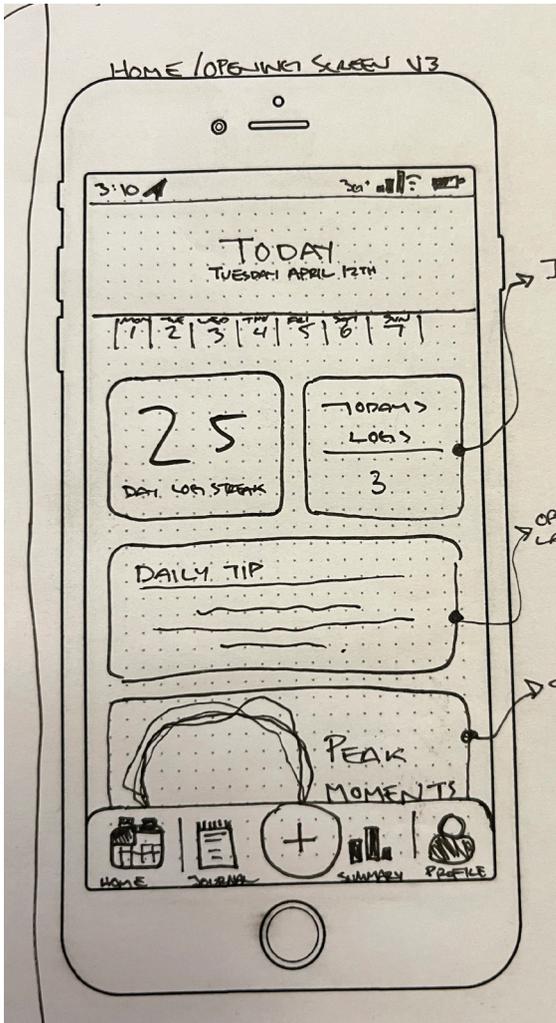


The animation for RestBand was decided after looking at many AI animations from films and stock websites due to their life-like look and feel. The idea behind it is that when the user is facing a low or regular state of stress, the circular lines make a smooth and consistent ring green in colour to show that they are in a good place. As the user begins to experience more stressors throughout the day, the ring will shift to represent those changes within them thanks to biometric data collected and shift to a more amber colour with slightly more irregular line patterns. The last and final phase in the animation is seen red when they have reached a peak level and the lines have gotten even more scattered and irregular.

Companion Application

What takes RestBand and amplifies its purpose and potential is the companion application that communicates with the wrist monitor. The RestBand wrist monitor is just one way to benefit the user by pointing out moments of stress but when combined with the app, they are then able to look even further into their experience over a day, week, or month. For the application, it is vital that the user experience is clean, and minimal, not packing too many additional features that may

overcomplicate the product ecosystem for some users due to the broad demographic. The app will have a daily check-in feature that will allow for a quick response as to how they are doing with the option of expanding in a “Journal” tab. Along with this, the user will also be able to look back in time at high or low moments under a “Summary” tab to see exactly what was going on for the RestBand to react the way it did and help the user better react in similar situations avoiding any type of overexertion.





06

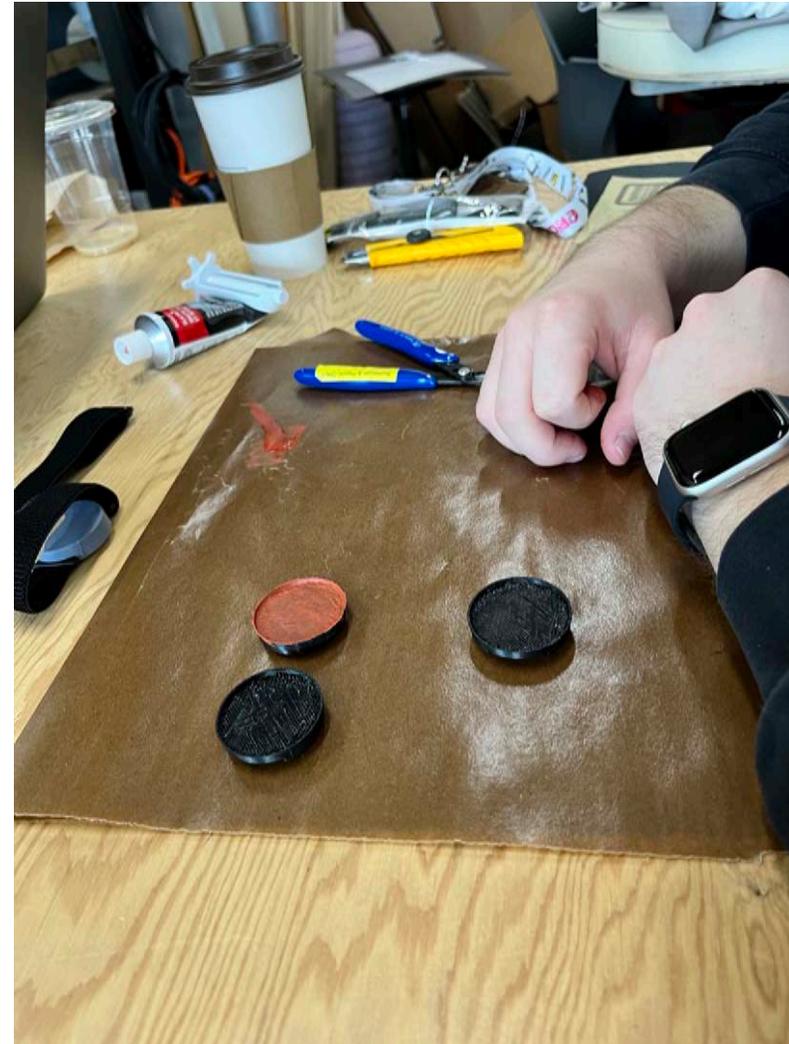
FINAL CONCEPT



Restband Wrist Monitor



Wrist monitor housing was 3D printed with a PLA



To get a better surface finish before painting, spot putty was used to fill cracks in surface



Wrist monitor housing was primed in preparation to be painted



Monitor housing primed (Left), and painted (Right).



Lenses were cut from glass sheets with the Waterjet to be used for the face of the wrist monitor



To secure the glass in the monitor housing, a bead of black silicone was used around the edge and later cleaned up with rubbing alcohol



The pull tab of the wrist monitor band was printed from a flexible filament (TPU) and sewn into the nylon band



The pull tab also prevents the band from coming out of the free loop to make it easier to put on

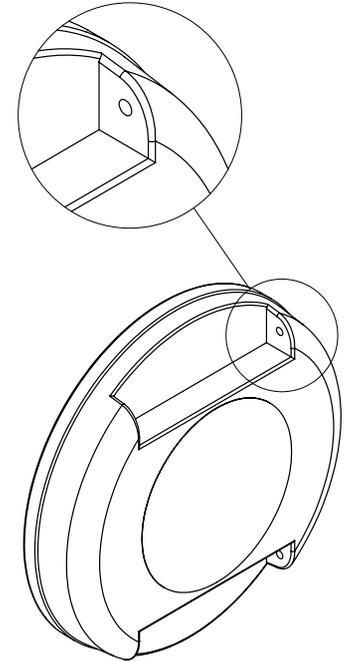
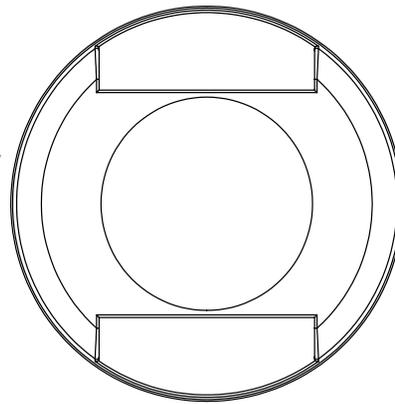
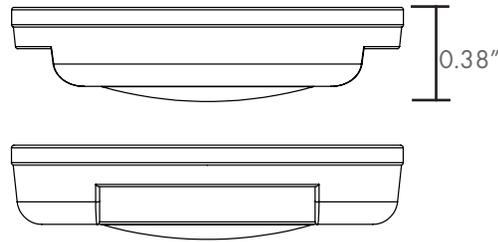
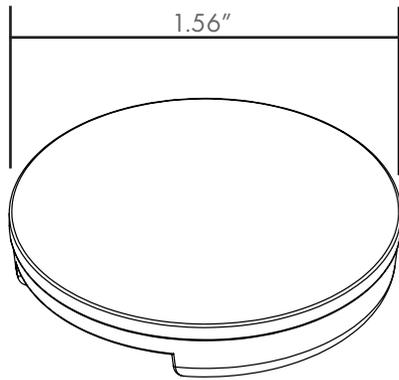
Final Assembly

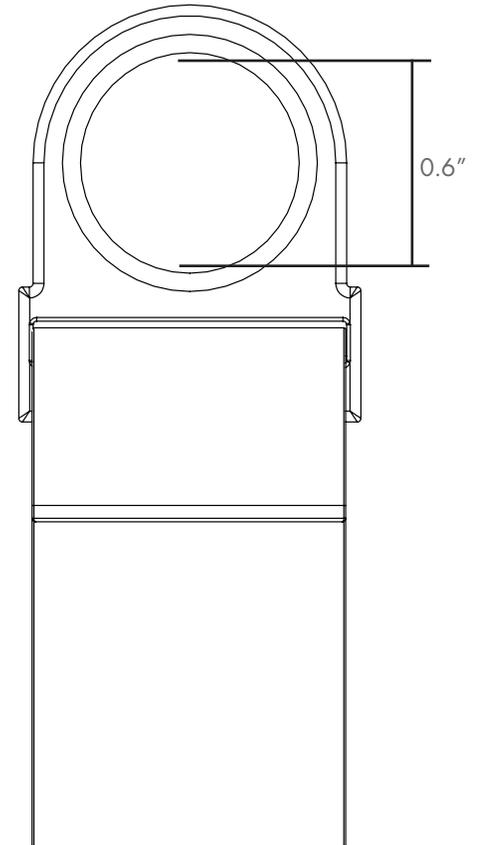
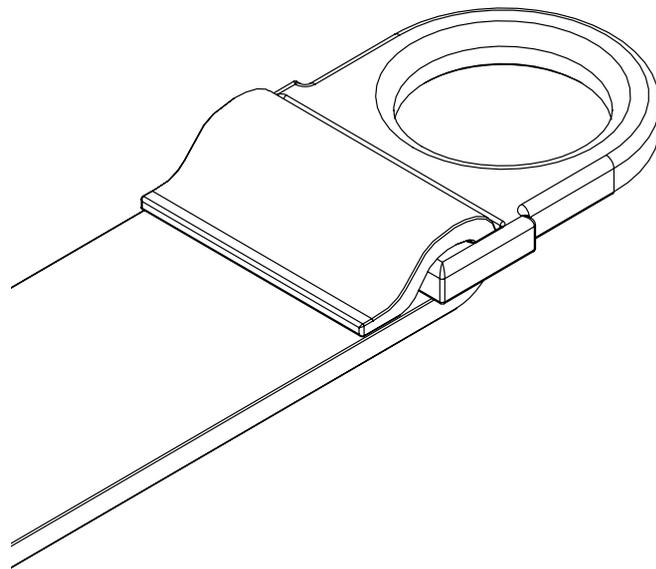
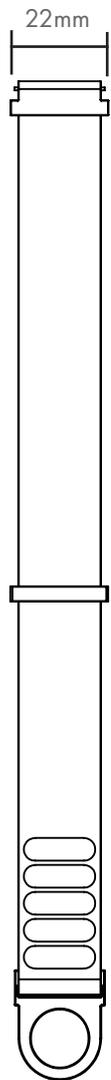
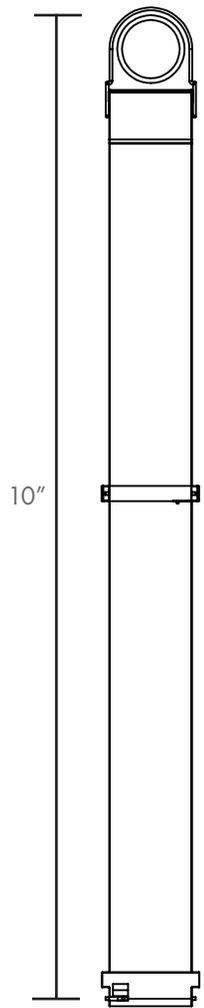




Pull tab being used to tighten and secure the band to the wrist

Dimensions





Materials & Specs

- **EDA Sensor**

(Electrodermal Activity Sensor) - Responsible for measuring how the body handles stress based on skin perspiration level measured by sending small electric charges on the skin

- **Heart Rate Sensor**

Used to track moments of intense activity based on the user's fluctuations in the heart rate

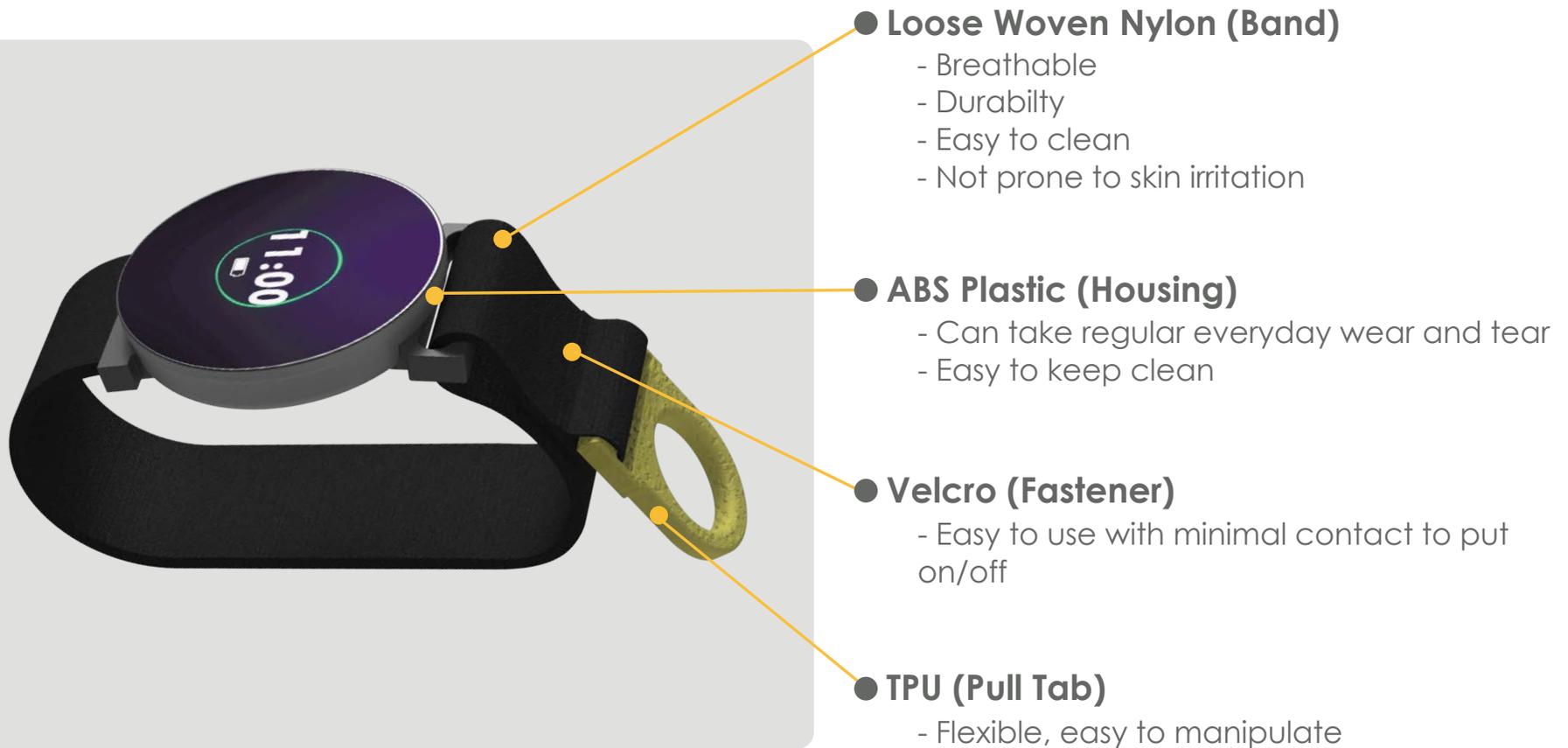
- **Bluetooth 5.3**

Used to connect to a mobile device to share biometric data collected on the wrist monitor with the companion application

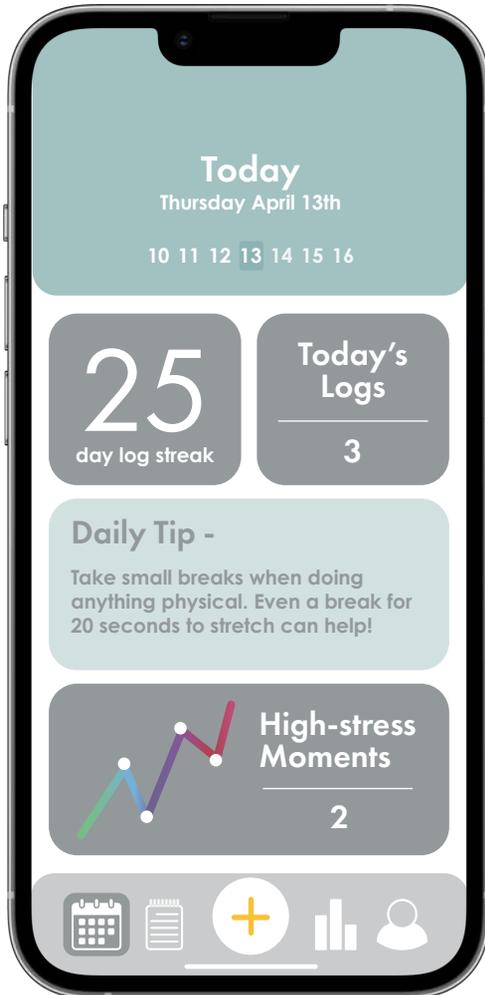
- **40mm. OLED Display**

Large vibrant display built into wrist monitor to show personal stats via animation



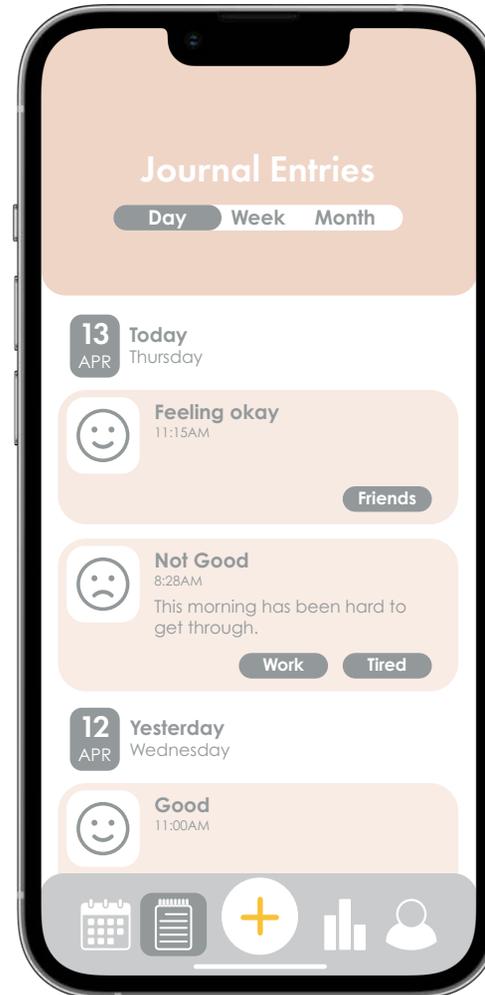


Restband Application



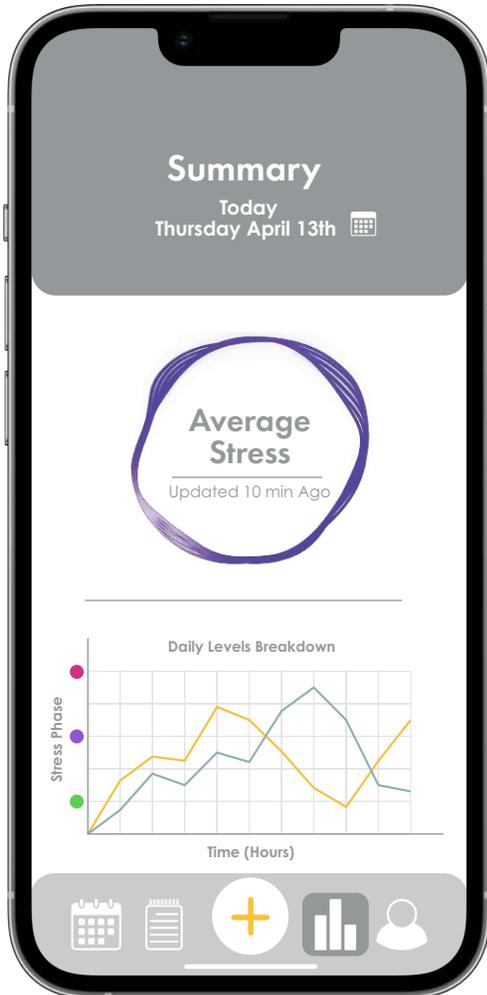
Home Screen

The home page is the primary screen when the RestBand application is opened. This tab provides a brief overview of the user's current stats and serves as the main directory when looking to navigate further into the app.



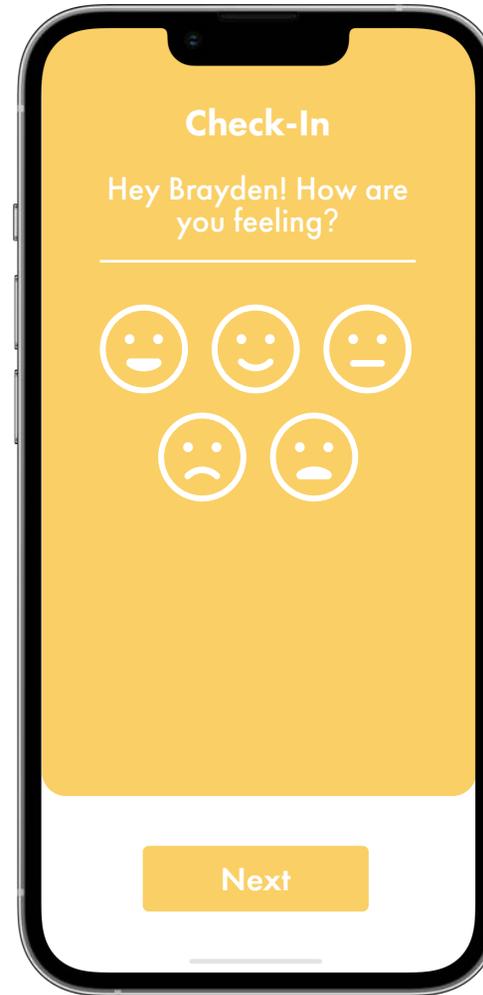
Journal Entry

The Journal Entries tab provides an opportunity for the user to log specific info about the day that they want to remember. This feature will help the user look back in time and understand what they were doing that may have contributed to a recent experience with fatigue.



Summary

The Summary tab takes collected data from the user over time via the RestBand wrist monitor and organizes it in a way that allows them to see a breakdown of their stress levels every hour and the many fluctuations experienced.



Check-In

The central Check-In button is an easy way for the user to quickly provide an update on how they are feeling and why that may be without having to write a long response. This is a quick, succinct, and effective way of tracking their daily progression.

A stylized orange number '07' where the '0' is a solid circle and the '7' is a thick, angular shape with a pointed top and a rounded bottom.

REFLECTION



Self Reflection

Throughout this process, I have learned a lot of different things applicable to many different areas that I am grateful for having gone through this process to realize.

Not only have I learned a lot about the complexities associated with Multiple Sclerosis, I have also learned how to go from a large and broad idea to a narrow and specific one. I also learned about the importance of asking the right questions and having interviews with people outside of your comfort zone. I got a lot of valuable

feedback from many different individuals, some of which I would have never thought to speak with but afterwards always left feeling more educated and aware of the area I was looking into. During this project time management has been of the utmost importance. One thing that I won't forget is how important it is to budget your time accordingly and to provide more time for yourself than needed because things will inevitably come up when you are least expecting them to.

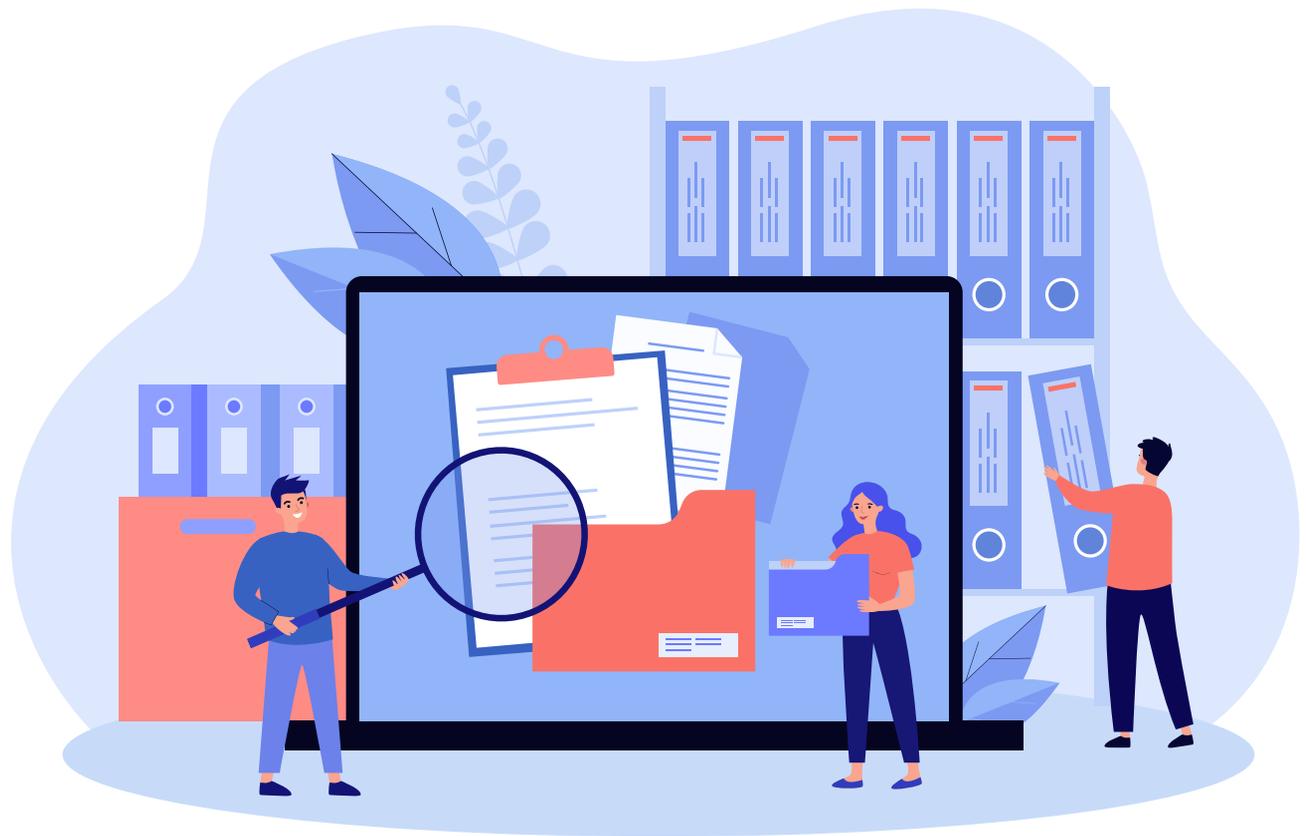


Fig. 13: Adobe Stock, People Taking

Bibliography

MS Society of Canada. (n.d). Types. https://mssociety.ca/about-ms/types?gclid=Cj0KCQjwj7CZBhDHARIsAPPWv3d-aiB81MCgWTu_tTcCl-GH6y195UYPPqDeS7R-eiNvHlydAwgDMRPkaApfPEALw_wcB

National Multiple Sclerosis Society. (n.d). Types of MS. <https://www.nationalmssociety.org/What-is-MS/Types-of-MS#>

National Multiple Sclerosis Society. (n.d). Secondary progressive MS (SPMS). <https://www.nationalmssociety.org/What-is-MS/Types-of-MS/Secondary-progressive-MS>

Hämäläinen, P., Rosti-Otajärvi, E. (2016). Cognitive impairment in MS: rehabilitation approaches. *Acta Neurologica Scandinavica*, 134 (Suppl. 200), 8-13. <https://doi.org/10.1111/ane.12650>

NHS. (2022, March 22). Symptoms: multiple sclerosis. <https://www.nhs.uk/conditions/multiple-sclerosis/symptoms/#:~:text=about%20diagnosing%20MS-,Fatigue,out%20even%20the%20simplest%20activities>

Costa, L. S., et al. (2020). Vision problems in multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*, 101 (12), 2263-2265. <https://doi.org/10.1016/j.apmr.2020.08.003>

MS Society of Canada. (n.d). About MS. <https://mssociety.ca/about-ms>

MS Society of Canada. (2000, December 10). Latest MS research news: prevalence and incidence of MS in canada and around the world. https://mssociety.ca/research-news/article/prevalence-and-incidence-of-ms-in-canada-and-around-the-world?force_lang=en_CA

Bennington-Castro, J., & Chua, P. J. (2021, October 5). Multiple sclerosis treatment. *Everyday Health*. <https://www.everydayhealth.com/multiple-sclerosis/guide/treatment/>

Appendix

Figure 1: Adobe Stock, Inner World. Retrieved from:

https://as2.ftcdn.net/v2/img/03/45/05/91/1000_F_345059120_SFsAVcMu63ilVfNLT0SRD0zpzrbiNUGg.jpg

Figure 2: Adobe Stock, Decision Making. Retrieved from:

https://stock.adobe.com/ca/Library/urn:aaid:sc:US:fbf04958-95ba-4003-98f6-b4a51961a35d?asset_id=439527666

Figure 3: Government of Canada, Multiple Sclerosis in Canada. Retrieved from:

<https://www.canada.ca/en/public-health/services/publications/diseases-conditions/multiple-sclerosis-infographic.html>

Figure 4: Azure, Opus. Retrieved from:

<https://www.azuremagazine.com/article/a-privacy-chair-draws-inspiration-from-horse-blinders/>

Figure 5: Mac Stories, Todoist. Retrieved from:

<https://www.macstories.net/news/todoist-introduces-new-upcoming-view-across-all-platforms/>

Figure 6: El Camino Health, Health Tech Devices. Retrieved from:

<https://www.elcaminohealth.org/stay-healthy/blog/health-tech-devices-whats-new>

Figure 7: Adobe Stock, Candidate. Retrieved from:

https://stock.adobe.com/ca/Library/urn:aaid:sc:US:fbf04958-95ba-4003-98f6-b4a51961a35d?asset_id=329014594

Figure 8: Adobe Stock, Chronic Tired. Retrieved from:

https://stock.adobe.com/ca/Library/urn:aaid:sc:US:fbf04958-95ba-4003-98f6-b4a51961a35d?asset_id=332625224

Figure 9: Photo by Klaus Huang. Retrieved on Dribbble:
<https://dribbble.com/shots/5384701-Artificial-Intelligence-design>

Figure 10: Peakpx, Short Circuit. Retrieved from:
<https://www.peakpx.com/en/search?q=power+savoured>

Figure 11: Photo by Klaus Huang. Retrieved on Dribbble:
<https://dribbble.com/shots/5436457-Artificial-Intelligence-design>

Figure 12: Photo by Gleb Kuznetsov. Retrieved on Dribbble:
<https://dribbble.com/shots/4787574-Organic-Artificial-Intelligence-design-for-milkininside>

Figure 13: Adobe Stock, People Taking. Retrieved from:
https://stock.adobe.com/ca/Library/urn:aaid:sc:US:fbf04958-95ba-4003-98f6-b4a51961a35d?asset_id=398449771