Lensy

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Overview

Problem

Digital eye strain is an issue that many individuals who spend extended periods of time in front of device screens face. The syndrome shows itself via a number of symptoms ranging from dry eyes, blurred vision, fatigue, headaches, difficulty in concentrating, and so on. Unfortunately, many individuals are heavily tied to various device screens for work, school, or other important reasons and do not have the option to detach from these screens in order to reduce symptoms. Furthermore, many individuals are not even aware that their symptoms are caused by a combination of their environment (lighting, font size, etc.) and device screens, thus do not even know where to begin in alleviating their symptoms. Over time, these symptoms may worsen and put an individual's eyes at serious health risk as well as make it nearly impossible to work at a screen for prolonged periods of time.

Solution

Our solution, Lensy, is a wearable pair of glasses combined with AR technology. The glasses contain several key functionalities in order to help reduce digital eye strain symptoms. They block blue HEV light that projects off of screens and adjust the lenses to the perfect shading in order to reduce symptoms depending on an individual's environment. As an individual works at various devices throughout the day, the glasses remind the individual to take breaks by looking away via customizable vibrating or pop-up reminders and ensure they are looking at something that is at least 20 feet away and for 20 seconds. The glasses are highly customizable and can be configured to not disturb during certain hours of the day, allowing them to work with a variety of schedules. The glasses also detect, via a small camera, what devices an individual looks at, for how long, lighting of the environment, angle and distance to the devices, and text sizes. Combined with sensors that detect certain symptoms like dry eyes and fatigue, individuals can monitor their progress over time via the analytics button on the side of the glasses. Resultantly, individuals can work at various device screens for long periods of time without experiencing symptoms, and assure that their eye health is in good hands.

Design Research Goals, Stakeholders, Participants

We conducted interviews with individuals who spend several hours every day looking at screens for school/work related reasons. We attempted to cover a range of participants and environments in order to understand the variety of factors that contribute to digital eye strain, why individuals cannot/do not do anything to relieve their symptoms and where our greatest opportunity to help is. This range included those who work in brighter/darker environments, those who are concerned about their digital eye strain/those who are not, those who work at 1-2/3+ devices a day, and those who are/are not knowledgeable about digital eye strain and existing helpful methods to reduce symptoms. The participants were:

Participant #1: Will Thompson (Senior Engineer Manager @ Major Tech Company)
Environment:

- Shared office space/open working spaces at the Microsoft Bellevue Office
- Lots of natural lighting/sometimes glare
- Aware and somewhat knowledgeable about digital eye strain but not a priority

Participant #2: Sara Frankel (Student in University Computer Science Department)
Environment:

- Work space in room at home/ shared spaces in CSE building
- Works in evenings so usually dimmer lighting
- Very aware of digital eye strain and wants to do something about it

Participant #3: Natalie Johnson (Stay at home mother/takes classes at a Community College)
Environment:

- Work space in various rooms at home
- Usually works during the day so lots of natural lighting
- Unaware of what digital eye strain is, experiences the symptoms

Participant #4: Emma Hansen (Student in University Computer Science Department)
Environment:

- Work space or on the bed in the dorm, in the library
- Works through the night time to darker lighting
- Aware of some solutions, but feels existing solutions are insufficient

*All names mentioned above are pseudonyms

We chose interviews as they gave us the best glimpse into an individual's environment and pain points, and worked well with our time restrictions. By asking the right questions, we found participants would go on small rants that ended up being extremely insightful. We had planned on conducting contextual inquiries, but time wise those did not work out. Regardless, our interviews provided us with interesting and unique themes to work off of.

Design Research Results and Themes

Summary of Key Findings

We observed that digital eye strain is often developed subconsciously and over time via extensive use of technology devices. We found especially those not in the tech industry were less informed about digital eye strain and its effects, whereas those in the industry did not actively take measures to prevent the syndrome's symptoms from worsening.

If breaks were taken away from screens and devices they were to complete mundane tasks such as food or restroom breaks in the office or to commute somewhere. In addition, through the participants we found that stress and looming deadlines negatively impacted the participants' incentive to take action against eye strain and take breaks since they forget or are simply to busy. Lastly, in interviewing participants with a wide range of backgrounds we found they have varied understanding of the issue, and would like to see highly customizable solutions. This means having options to see daily reports to incentivized reminders in order to promote better practices when it comes to prolonged use of devices while still being able to complete all their high priority tasks and not decrease overall screen time.

Themes

- Many participants feel like they forget to take actions that could potentially help reduce their eye strain
- Many participants feel like they are too busy to be able to take action (many claim the only time they really get for breaks is when they are commuting/eating/using the restroom/etc.)
- If individuals want some form of reminders, they feel like they need some additional motivation or something to drive discipline
- Many participants are not aware of causes, prolonged effects, but are familiar with simple features that can help reduce digital eye strain (like auto brightness or night mode) but don't really go beyond this
- Participants are looking for a highly customizable solution that fits with their schedules and needs
    - Some want daily reports
    - Some do and some do not want reminders
    - Some want something they can mute whenever
    - Some want things to run in the background as much as possible while others want recommended exercises/actions
- Participants have varying understandings of digital eye strain and its symptoms (some wish to understand digital eye strain better alongside reducing it)

Task Analysis

1. **Who is going to use the design?**
   Anyone from young adults to older individuals who suffer from digital eye strain due to excessive screen usage and want to take either active or passive steps to address the issue, and also those who may not be fully aware of the prolonged effects but want to be educated and given tips on how to reduce strain.

2. **What tasks do they now perform?**
   Our participants were all engaged in high priority tasks throughout the day during work or school hours and as result did not consciously think about steps to prevent digital eye strain. After eye doctor appointments participants noted they were more inclined to take preventive measures but over time this was not consciously thought about with more pressing tasks at hand. Breaks taken throughout the day such as water or restroom breaks, and breaks such as walking to different classes for college students also were not a conscious decision but may have stemmed from discomfort of sitting and staring at devices for a prolonged amount of time.

3. **What tasks are desired?**
   We aim to provide a solution for those experiencing various symptoms related to digital eye strain and also create awareness of the symptoms and long-term effects of digital eye strain. We want to customize to the user, whether they want reminders and tips on how to reduce eye strain throughout the work day by taking active/passive steps, or create a system to incentivize people to track and improve their screen usage habits through mindfulness of the long-term bodily effects. This will still allow users to complete their daily tasks of using various devices for work, school, reading, gaming, and other leisure activities while taking preventative measures against eye strain and not distract from completing high priority tasks.

4. **How are the tasks learned?**
   Usage of technology has become an imperative part of the lives of many teenagers adult whether they are in the tech industry or not and these daily tasks have been performed for many years out of habit. Though bad screen usage habits may seem comfortable and efficient in the short term, through studying our participants we realized many aren't aware of the prolonged harm that these tasks can have on the eyes, productivity, and energy expenditure.

5. **Where are the tasks performed?**
   Since our topic is digital eye strain, most tasks are performed in daily settings. From the participants, the majority of the tasks are done either at their workspaces or at their homes where they spend most of their time in front of the screens for either working purpose or leisure.

6. **What is the relationship between the person and data?**

The data we are keeping track of is the daily average amount of time our participants are in front of various devices and how this affects their eye health and any symptoms of digital eye strain. This data originates mainly from participants habits and personal preferences, even though their habits may not be the most beneficial to their health. Also, the amount of usage across different devices throughout the day, and in what conditions such as lighting, position and viewing angle of the device, and text size show some relations to digital eye strain symptoms our participants suffer.

7. **What other tools does the person have?**
   Our participants have access to all kinds of devices, including computers, phones, and TVs. They would use the built-in tool of their phones to keep track of the average and maximum time they spend on their phones. To keep track of the screen time of other devices, they typically give their estimations and they don't usually have a tool to keep track of those time.

8. **How do people communicate with each other?**
   Based on our topic, digital eye strain, it does not involve much about communication with others. Still, the participants may communicate with their doctors about the screen usages and eye health. Also, as they are with their friends, they might also talk about screen time such as during interactive gaming.

9. **How often are the tasks performed?**
   For most people suffering from digital eye strain, sitting at X device(s) is a daily task. For different individuals in various school, industry or home settings - time at specific devices will vary on a daily and weekday/weekend basis.

10. **What are the time constraints on the tasks?**
    Since we are tackling individuals who are tied to their devices for several hours a day we want to be able to allow them to do so without experiencing the symptoms of digital eye strain. Essentially we are constrained by the time individuals spend at various devices and the deadlines they have to meet for high priority work or school related tasks.

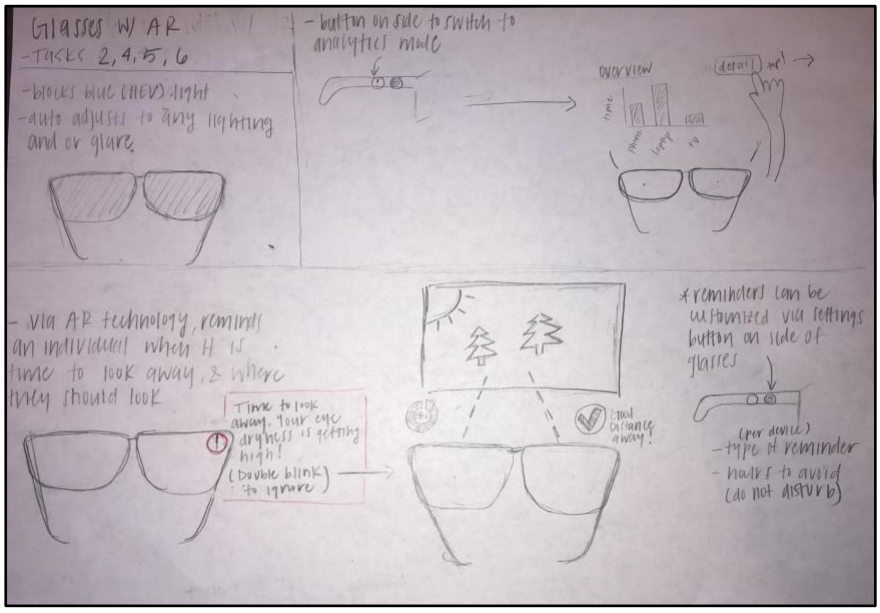
11. **What happens when things go wrong?**
    When individuals begin to experience symptoms because of digital eye strain they are usually forced to step away from the device until their symptoms lighten or they can try to ignore it if they cannot step away only making matters worse. Unless the individual takes drastic steps to reduce their harmful screen time, they will continue to experience the symptoms as soon as they are back in front of a screen.

Proposed Design Sketches

Design 1: Wearable Eyeglasses (AR)

Description:

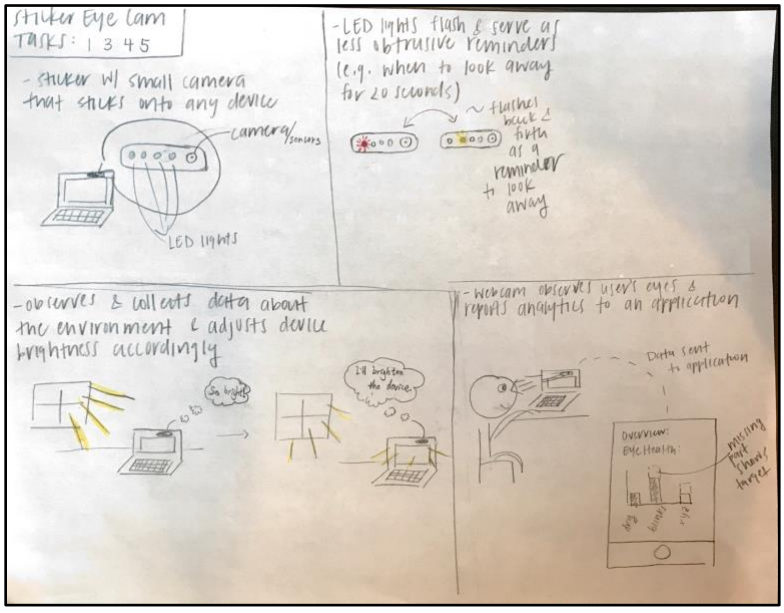
This design is a pair of wearable glasses that block blue/HEV light and auto adjust to environment lighting. The AR technology displays reminders to reduce eye strain symptoms (i.e. look away 20-20-20 rule, adjust screen text size, angle of vision). The reminders could also be audio or vibrations stemming from the frames. There is a settings button on the side of the glasses that allows for customization of reminders (certain hours ~ do not disturb) and an analytics button that showcases statistics about device usage, symptoms, and progress over time.



Design 2: Sticker Eye Tracker

High-Level Description:

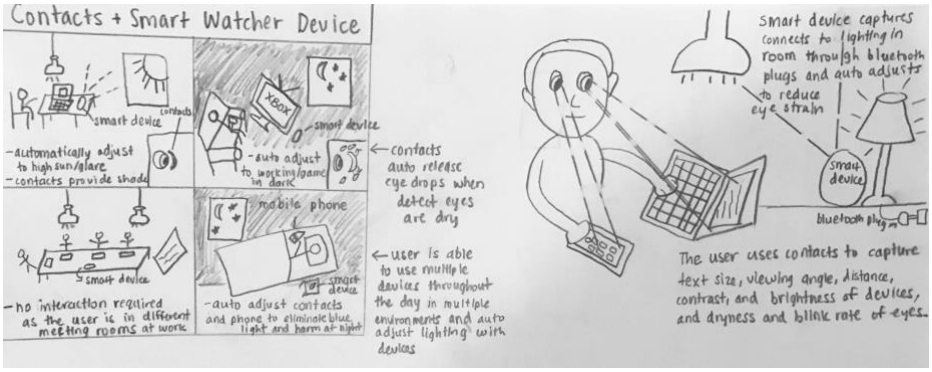
This design is a sticker that can be placed on multiple devices or on one, and through the embedded sensors and camera will collect data about the lighting of the environment and an individual's personal eye health. One thing to note is that this design is not very intrusive. The stickers can synchronize the data they collect to a computer application, analyze the screen time of the users, and provide some suggestions about the individual's eye health. The sticker also has an LED light display which uses different lights to inform users how long they spend on the single device. Additionally, the sticker can act based on how users set it up through the application, which involves customization in light intensity and shining pattern.



Design 3: Contacts paired with Smart Watcher device

High-Level Description:

This design is contacts that provide an unobtrusive way to track eye health and factors of the environment including viewing angle, text size and distance to devices, and brightness and contrast of device in view. The smart watcher device is a portable device that can be put in any room and connects to the devices and lighting in that room through Bluetooth. This device will measure metrics such as brightness of the surrounding room, and with the information gathered from these devices, the smart watcher device will automatically adjust the brightness of the room and the device currently being used to be the most ideal for reducing digital eye strain supporting task six. The contacts will also release water into the eyes as it detects eyes are dry, or as prescribed by the eye doctor, and will provide shade to reduce glare and eliminate blue light.



Selected Design + Tasks

The design we selected moving forward is the wearable AR glasses. We choose this design since we wanted to have a highly active, portable and customizable solution to help our target participants - individuals who want to take active measures to reduce digital eye strain but have many tasks that force them to stay in front of screens for long periods of time. This design is well suited for such individuals because it is customizable for a variety of schedules and focus levels. Glasses are also lightweight and portable, thus easy to transfer between various environments and as we saw throughout our research - individuals work in a number of shared spaces, offices, and home spaces. This design also best accounts for design feedback we received to include personalized and non-digital modalities (AR only adds digital elements).

The **two tasks** we chose to focus on are:

1. Working on a task in a shared space or home for long durations without experiencing digital eye strain. This includes working at about 1-2 devices, and variable lighting + environment.
2. Educate self about digital eye strain, and understand personal digital eye strain symptoms + see the progress of these symptoms over time.

The first task, in particular, was compelling as it stresses the importance of both the task at hand and reducing digital eye strain, forcing us to consider priorities aside from symptom reduction. Given the fact that the glasses design are highly customizable, we allowed this task to be a bit more broad to account for different environments and schedules. We also thought both of these tasks complement each other well as in order to combat digital eye strain participants need to be incentivized by their current eye health. During our design research we found participants were more cautious of their eye health the few days after eye doctor appointments, and being able to track eye health and see daily analytics whenever they choose will in turn motivate users to take active measures assisted by the glasses to prevent digital eye strain.

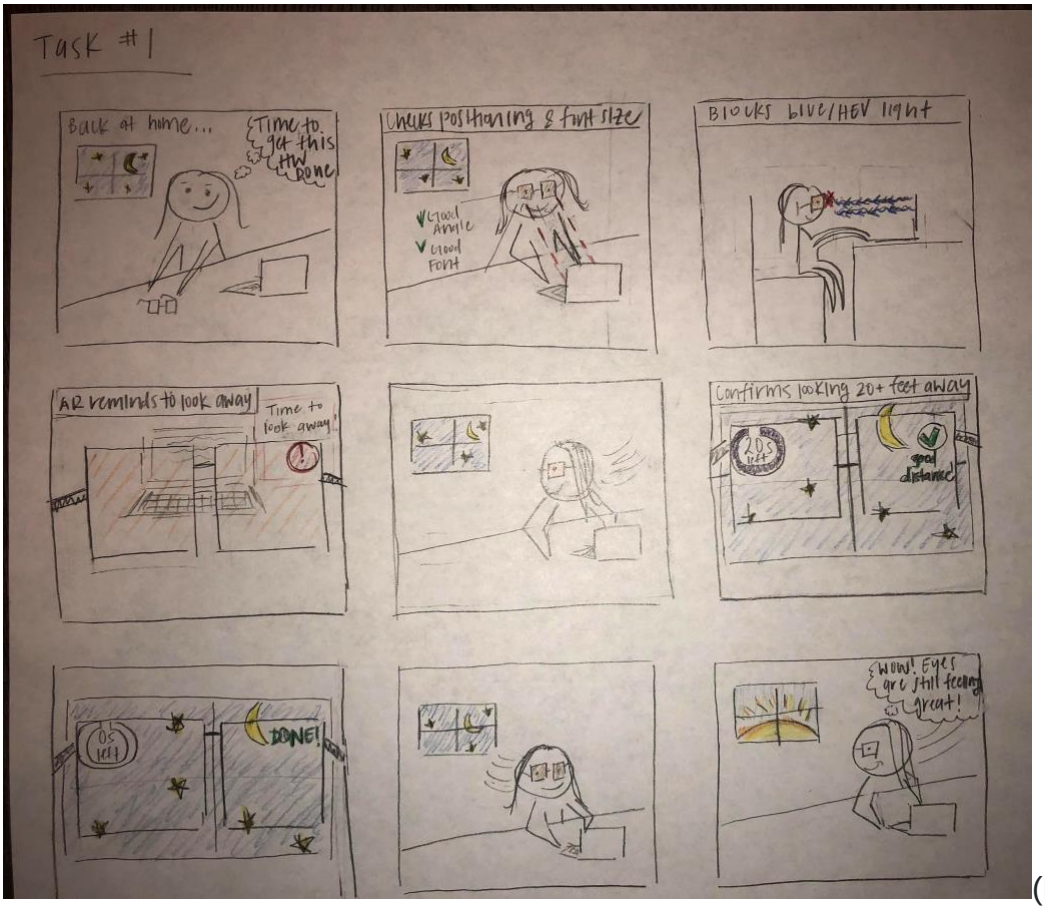
Written Scenarios

Task #1 Scenario (Figure 1): Sara has a programming assignment that she is just starting and knows she will need to pull an all-nighter for. She arrives home from class and starts her work at 10 PM. Sara has particularly dry eyes that her eye doctor constantly warns her about. Hence, she puts on her recently purchased Lensy glasses, hoping the reminders will help reduce her symptoms. When the Lensy glasses sense that they are being worn, with its built-in sensors and cameras, they automatically measure the distance between Sara's eyes and the screen, and ensure the font size is large enough. They detect Sara is looking at some very small font, and display (via AR) a reminder in the upper right corner of her frames for her to zoom in a little. The glasses also check the lighting of both the computer screen and room, both look good at the moment so the glasses display (pop-up checkbox display for few seconds) that she passes the lighting verifications. Meanwhile, the specially designed lenses turn yellow to block the harmful blue light emitted from the computer screen. Following the 20-20-20 rule, a reminder is given every 20 minutes to inform Sara that she needs to look away for 20 seconds. Sarah has configured this reminder to be a vibration instead of a popup to minimize disturbance. When Sara look outside the window, the glasses turn back to clear lens and confirm that she is looking at objects 20 feet away. Also, the AR displays a clock that counts down for 20 seconds. After looking away for 20 seconds, Sara looks back and continues her work. She continues this through the night. At 6 a.m., she finally finishes her project and, with the Lensy glasses, she does not feel dry eyes as she would usually feel when she works for a long period of time.

Task #2 Scenario (Figure 2): The crucial part of Lensy glasses design is that they help individuals keep tracks of their screen time/symptoms and they educate individuals about digital eye strain. Michael recently purchased the Lensy glasses in hopes of reducing his dry eyes and blurred vision that he gets in the evening after working at his laptop all day. Upon purchase, Michael set up the glasses by answering the AR prompts displayed to him including his device info, current eye health, prescription numbers, family history of eye disease, and eye doctor visit dates. Today marks a week of wearing the glasses and he decides to check his progress. He taps on the analytics button on the side of the glasses and immediately sees an overview display (via the AR). This overview shows him a bar graph of how much time he spent at each of his devices. Each bar is shaded with how much of the screen time was negligible to his eye health and how much is more concerning (if he ignored reminders for a long period of time or environment lighting was unideal). Michael taps in the air with his fingers on the details button to get a more in-depth view of the information. He scrolls to the graph that shows his symptom progress. He sees that his eye dryness is decreasing on the point scale. He is not sure what the points mean so he taps on the question mark next to the bar, and sees some text pop up explaining its how much he blinked every hour. He sees that his vision is still a bit blurred, but getting better and notices a tip pop up on that symptom letting him know that his working light environment is too dim. He decides that for this upcoming week at work he will keep open the shades for the window in his office and takes off the glasses.

Storyboards of the Selected Design

Task description: Working on a task in a shared space or home for long durations without experiencing digital eye strain. This includes working at about 1-2 devices, and variable lighting + environment

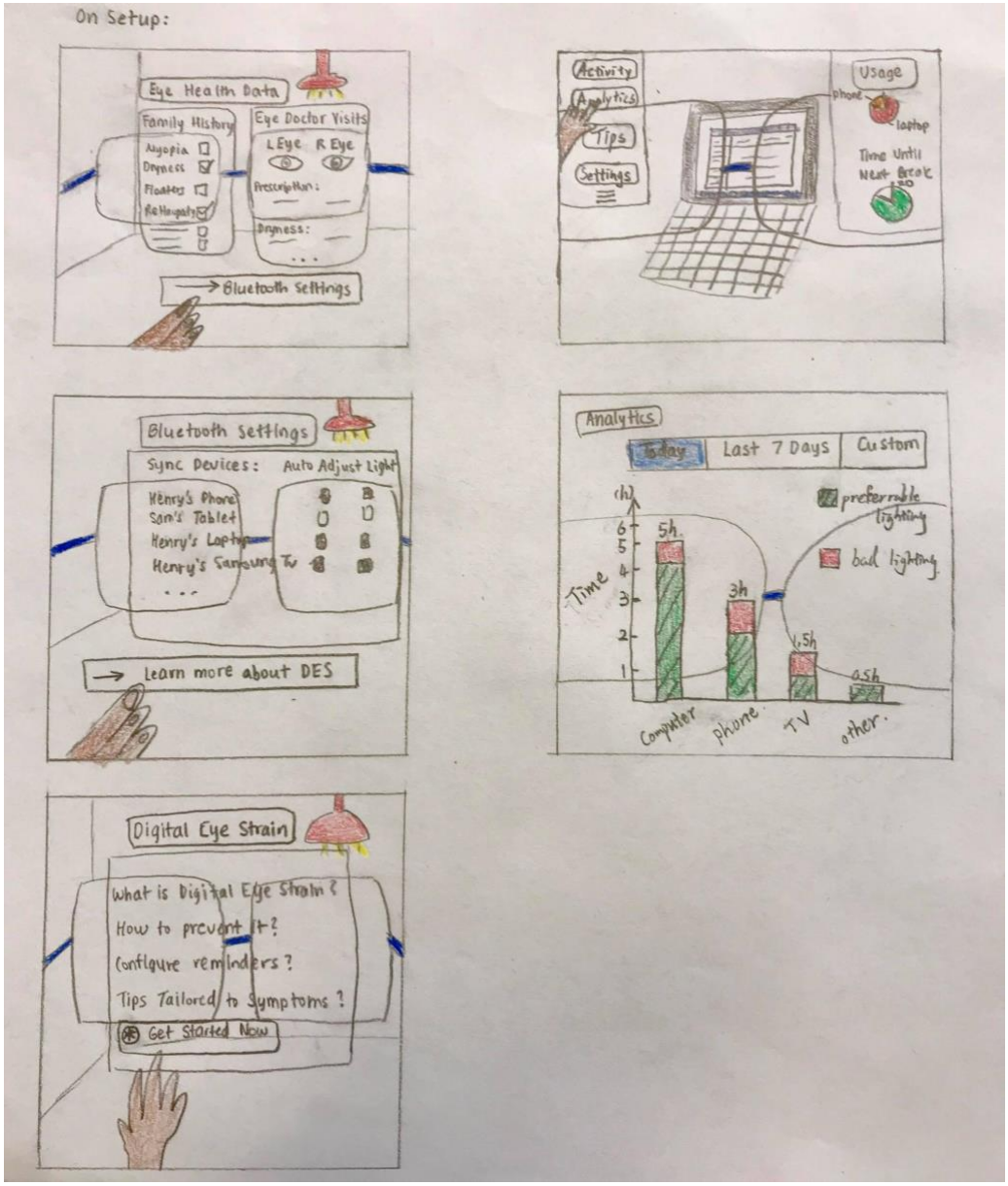


(Figure 1)

Task description: Educate self about digital eye strain, and understand personal digital eye strain symptoms + see the progress of these symptoms over time.

The Left column shows the way in which the AR technology can be set up including part eye health information, connecting to the lights in the nearby environment, and educating oneself about digital eye strain tailored to symptoms that the user has been experiencing.

The right column shows the analytics the user can view regarding their overall device usage and relative eye health.



(Figure 2)

Contribution Statement:

Amy Shah: 25%: Updated second storyboard, task analysis questions, proposed design sketches, themes and scenario.

Max Ding: 25%; wrote written scenarios part, updated the proposed design sketches

Julija Pettere: 50%; Laid out document, wrote out parts 1-5 & 7, updated first storyboard and second scenario