Wearable Light Logger to Facilitate Full Spectrum Light Dosing for Mood Disorders

Date: October 11th to October 17th, 2024

Client: Dr. Jean Riquelme
Advisor: Dr. Brandon Coventry
Team:
Molly Wilhlemson mwilhelmson@wisc.edu (Team Leader, BSAC)
Ella Eklund ereklund@wisc.edu (Team Leader, Communicator)
Neel Srinivasan nsrinivasan8@wisc.edu (BPAG)
Kate Briesemeister kbriesemeist@wisc.edu (BWIG)

Problem Statement

Currently, there are no affordable wearable light-logging devices on the market. Full-spectrum light therapy has been proven to be successful in treating mood disorders, especially seasonal affective disorder, but patient response studies are lacking. A wearable allows for accurate representation of light intensities that reach the retina, the presumed site of action. A wearable light logger would provide convenient research into what correct dosages for optimal patient response look like for patients suffering from mood disorders.

Brief Status Update

This week, we completed our preliminary report, got it sent to our advisor and client, and uploaded the report to our website. We met as a team to begin the initial prototyping process. We soldered the Raspberry Pi Pico to the breadboard and began coding it.

Summary of Weekly Team Member Design Accomplishments

- Team:
    - Finished the preliminary report
    - Began initial prototyping

- Molly Wilhelmson:
    - Began calculating resistor values for our light sensor circuit based on component datasheets
    - Researched the physiology of the eye

- Ella Eklund:
    - Finished assigned sections of the preliminary report
    - Conducted extensive research into light entering the retina and SAD

- Neel Srinivasan:
    - Started coding the Raspberry Pi Pico
    - Researched necessary grounding components for photoresistor addition to breadboard

- Kate Briesemeister:
    - Researched general information on mood disorders and Seasonal Affective Disorder to include in the preliminary report
    - Finished the assigned sections of the preliminary report and uploaded it to the website

Weekly/Ongoing Difficulties

Finding converters for small op-amp and analog to digital converters.

Upcoming Team and Individual Goals

- Team:
    - Make progress designing circuitry and code
    - Begin drafting a solidworks file for the circuit boxes
- Molly Wilhelmson:
    - Work with Ella to make our light sensor circuit
- Ella Eklund:
    - Start constructing a photoresistor circuit
    - Communicate with psychiatrist recommended to the team about SAD and other mood disorders
- Neel Srinivasan:
    - Continue/Finish coding template
    - Test coding with sample photoresistor to prepare for the device's actual photoresistor
- Kate Briesemeister:

- Download CAD files for box and manipulate the dimensions in order to fit the breadboard

Project Timeline

Project Goal	Deadline	Team Assigned	Progress	Completed
Meet with client	09/13	All	100%	Yes
→ Product Design Specification	09/20	All	100%	Yes
Preliminary Presentations	10/4	All	100%	Yes
Preliminary Deliverables	10/9	All	100%	Yes
Show and Tell	11/01	All		
Poster Presentations	12/06	All		
Final Deliverables	12/11	All		

Expenses

Item	Description	Manufacturer	Part Number	Date	QTY	Cost Each	Total	Link
Component 1								
Happy Light	Light for testing sensor	Verilux	N/A	9/13/24	2	$49.99	$99.98	Link

Component 2								
Battery	Battery for chip	PGSONIC	CR2045	9/19/24	1	$1.15	$1.15	Link
Component 3								
Head Lamp	Light that attaches to head	Fire Supply Depot	FL8210-6SMD	9/26/24	1	$11.92	$11.92	Link
Component 4								
Raspberry Pi	Chip for coding	Raspberry Pi	Raspberry Pi Pico W	10/4/24	1	$7.20	$7.20	Link
Component 5								
Comparator	Building circuit	Texas Instruments	LM393PE4	10/4/24	2	$0.25	$0.50	Link
Component 6								
Battery Holder	Holder for coin battery	Digikey	BS-2450	10/4/24	1	$3.84	$3.84	Link
Component 7								
OPAMP	Building circuit	Digikey	AD8276ARZ	10/4/24	1	$7.37	$7.37	Link
Component 8								
IC DAC 12BIT V-Out	Building circuit	Digikey	MCP4726A0T-E/CH	10/4/24	3	$6.48	$6.48	Link

TOTAL:	**$138.44**