

Preliminary Design: Cooling Humidified Device

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Advisor: Nathalia Peixoto
Sponsors: Community Patients, MS Patients,
Respiratory Patients



Background Information & Relevance

- Thermal Regulation
 - MS patients^[1]
 - Increase symptom severity^[1]
 - Heat intolerance^[1]
 - Symptoms include fatigue, and shortness of breath^[2]
 - Patients with Respiratory Issues
 - Too much heat → increase symptom severity
 - Shortness of breath
 - Menopause
 - Hot flashes
 - Relevance?



Problem Statement

A way to address the issue of patients suffering from respiratory issues due to staying out in the heat for too long in patients with multiple sclerosis that will allow for these patients to have an improved, less dependent life quality.



Requirements & Standards

Requirements:

- Creating a lightweight, battery-powered, portable and easy to carry,
- Safe cold vapor dispenser which must be cost-effective
- Contain a water storage unit and function for an hour

Standards:

- ISO 20789:2018: Anaesthetic and respiratory equipment – Passive humidifiers
- ISO 9360-1:2000: Anaesthetic and respiratory equipment – Heat and moisture exchangers (HMEs) for humidifying respired gases in humans – Part 1: HMEs for use with minimum tidal volumes of 250 ml



Relevant Equations

Energy Consumption = Power x Time

Power = Voltage x Current

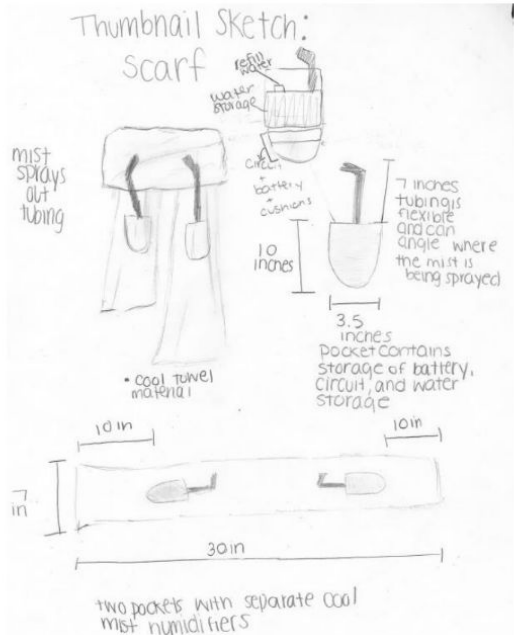
Voltage = Current x Resistance

Flow Rate = Water Pressure x Restrictions = Velocity x Area

Design Alternatives



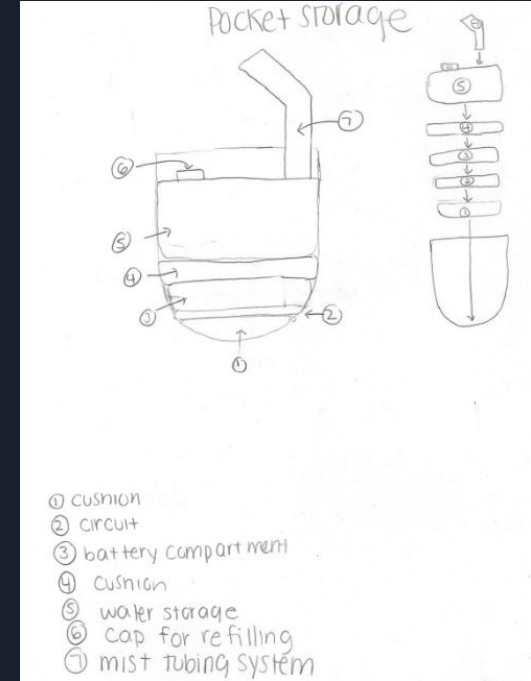
Cooling Humidified Scarf



Sketch of Scarf



- Pros
 - Light
 - Storage
- Cons
 - Stability
 - Motor power



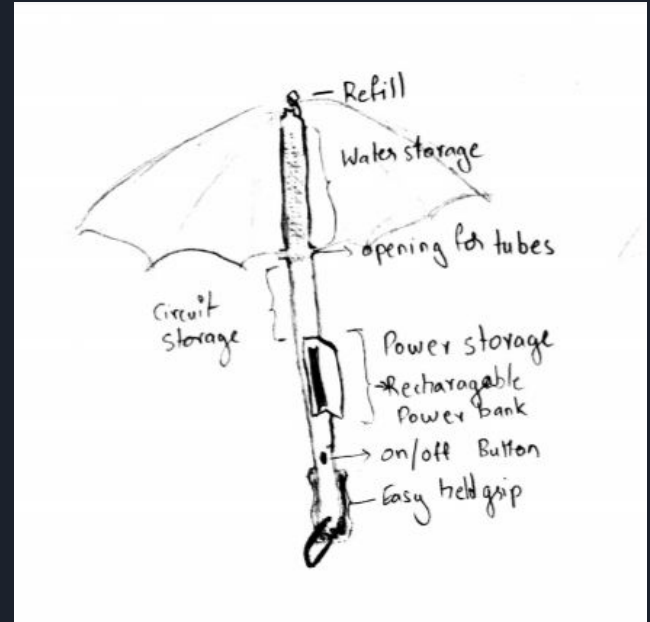
Sketch of Pocket System

Cooling Humidified Umbrella



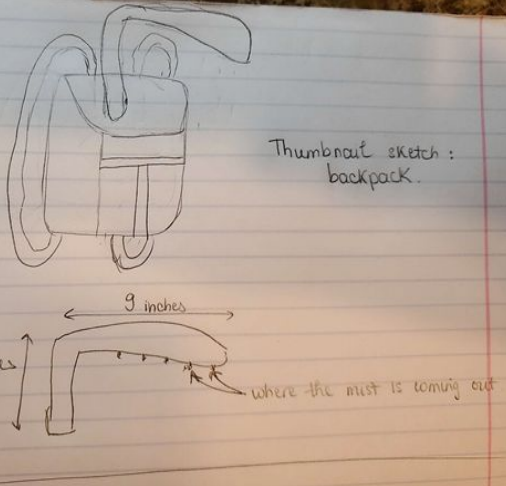
DUVEX Cooling Umbrella

- Pros
 - Easy to use
 - Cost-efficient
- Cons
 - Weight in handle
 - Different models available



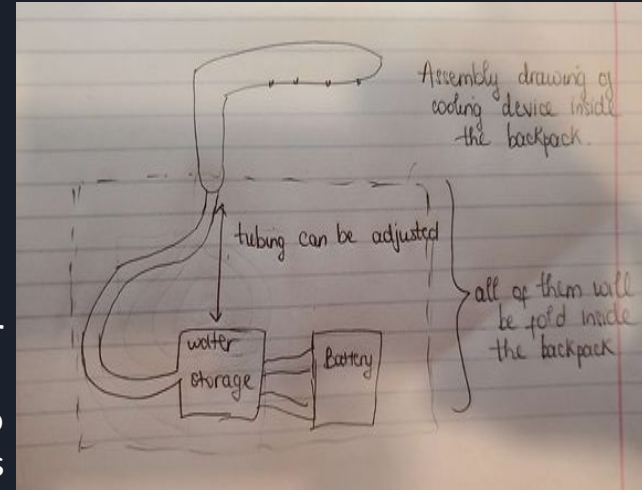
Sketch of Umbrella

Cooling Humidified Backpack



Thumbnail of Backpack System

- Pros:
 - Storage
 - Transferrable
 - Easy to carry around
- Cons:
 - Large amount of motor power
 - Not convenient to go around when the top is opened.



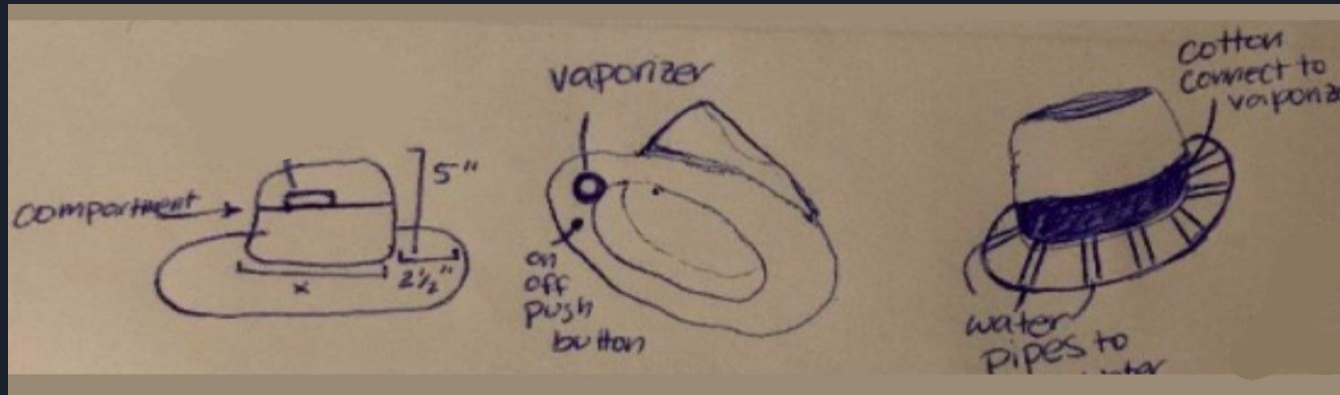
Sketch of Backpack System

Preliminary Design



Cooling Humidified Hat

- Convenient, stable, battery powered (rechargeable) , on/off button
 - same as umbrella but hands free
- Vaporizer under the brim, keeping temp lowered
 - Works using a network of soaked cotton filter sticks - when dry auto shut off
- Fabric of hat - breathable and evaporative to keep the temperature even lower
- Wide brim - sun protection



Sketch of Hat System



Specification & Metrics

- Durability test
- Cooling test
- Storage Volume
- Energy Consumption
- Motor power test (Battery test)
- Hat Width
- Hat Weight



Next Step...

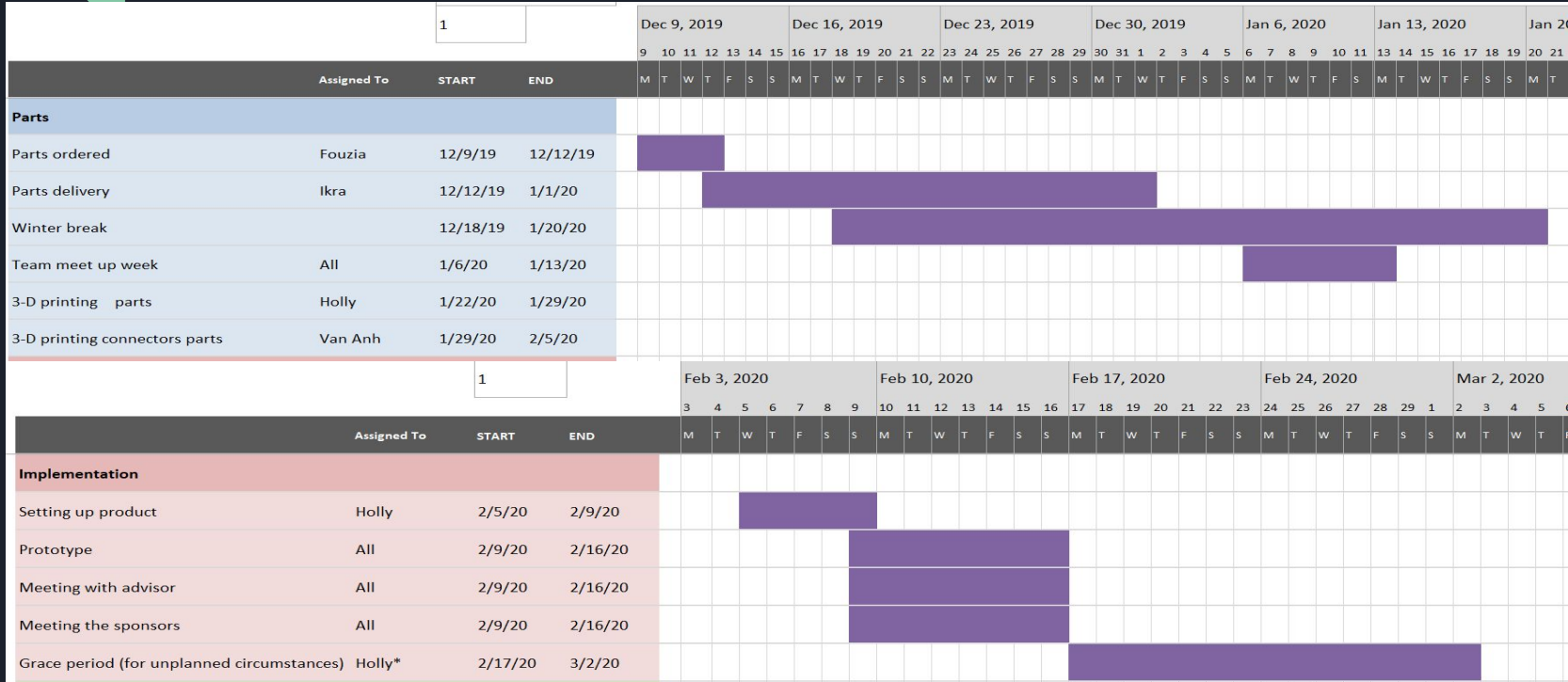
- Continue Meeting as a team every Thursday
- Have reports done two days prior to the due date.
- Meet clients twice a month and update our plans with new requirements
- Advisor updates by email (primarily), meeting monthly
- Build a model of the design
- Order materials

Proposed Timeline- Fall 2019

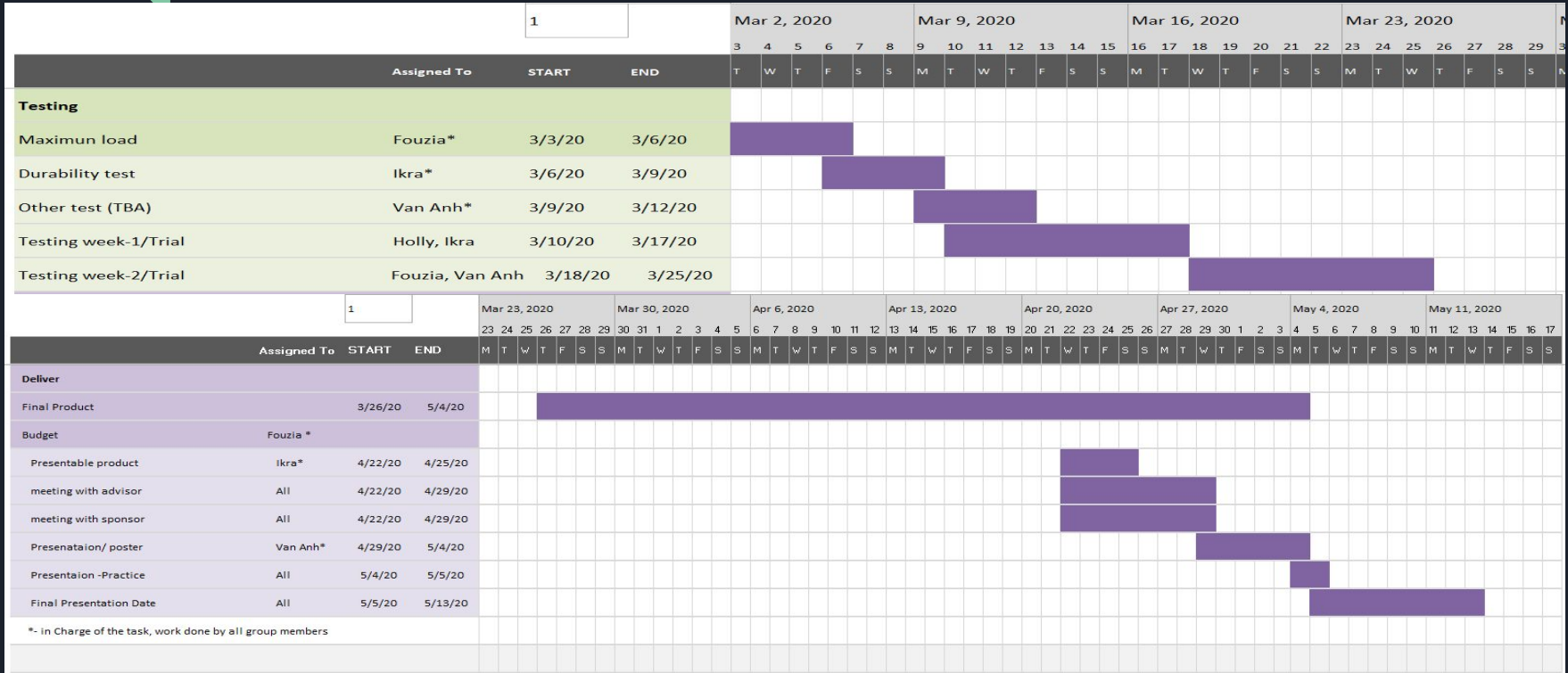
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Meet advisor		11/21/19	11/21/19																																																													
Critical Design	Ikra*	11/15/19	12/6/19																																																													
Critical Design report draft	Holly*	11/21/19	11/26/19																																																													
power point slides	Van Anh*	11/30/19	12/4/19																																																													
Presentaion -Practice	All	12/4/19	12/5/19																																																													
Presentation Due		12/6/19	12/6/19																																																													
Critical design Report due		12/6/19	12/13/19																																																													
Design history file	Van Anh	10/14/19	12/14/19																																																													
CATME evaluation due 2		12/14/19	12/14/19																																																													
Components Ordered	Fouzia	11/21/19	12/14/19																																																													

*- in Charge of the task, work done by all group members

Proposed Timeline-Spring 2020 (Dec-Feb)

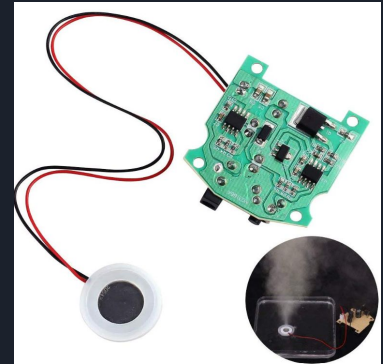


Proposed Timeline-Spring 2020 (Mar-May)



Proposed Budget

- Budget: \$100
 - Mist atomizer circuit - \$9.00 each
 - Hat - \$40.00
 - Battery - \$3.00
 - Tubing- \$10.00 each
 - Cotton filter sticks - \$10 for pack of 30



Thank you!
Questions?





References

[1] SL, D., O, J. and TE, W. (n.d.). *Thermoregulatory dysfunction in multiple sclerosis*. - *PubMed - NCBI*. [online] Ncbi.nlm.nih.gov. Available at: <https://www.ncbi.nlm.nih.gov/pubmed/30459034> [Accessed 27 Sep. 2019].

[2] "Cooling for Multiple Sclerosis and Heat Intolerance | Polar Products", *Polarproducts.com*. [Online]. Available: <https://www.polarproducts.com/polarshop/pc/Cooling-for-Multiple-Sclerosis-and-Other-Heat-Intolerant-Conditions-c442.htm>. [Accessed: 27- Sep- 2019].

[3] S. Easterday, "Best Cooling Towels Reviewed, Tested & Compared in 2019", *RunnerClick*. [Online]. Available: <https://runnerclick.com/10-best-cooling-towels-reviewed/>. [Accessed: 30- Oct- 2019].

[4] "DULEE Portable Cooling Humidifier Spray UV Protection Umbrella Windproof Waterproof Golf Umbrella With USB Charge,Black", *Amazon.com*. [Online]. Available: <https://www.amazon.com/dp/B07WXP87V5>. [Accessed: 03- Nov- 2019].