

# Walking Stimulus

Group C5

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# About parkinson's

Our bodies have a special brain cell that lets us have a smooth and coordinated muscle movement and allows to carry out physical tasks with ease. As we grow older, these brain cells start to diminish and when this happens our movements become slow and we aren't able to function as much like we used to. If these brain cells continue to die, that's when we encounter parkinson's.

There is no cure for this disease but prevention is easy. If you keep exercising or perform any physical tasks on a daily basis then it is highly unlikely for you to get parkinson's.

Some of the symptoms for this disease include: constipation, tremors, blank facial expressions, hallucination and freezing of gait.

# Our Problem

The main problem faced with parkinson's patients is freezing when walking. This is known as Gait. Overcoming it is challenging and current methods are expensive.

There are methods out there and however for each person the problem is different and therefore our product needs to be client specific.

In our first meeting we had a client rollie how has parkinsons however, does not have freezing problems so narrowing down solutions was not as easy. We were given certain which were that the product was small and light.

# Our Goal

To create a product that will consistently help overcome freezing for parkinson's patients for a reasonable price.

# Needs List

#	NEED	Importance
1	The device is not too visual or embarrassing to wear.	5
2	The device is affordable.	4
3	The device is easy to interact with.	3
4	The device allows the user who is affected by Gait Freezing to start walking.	4
5	The device is portable/ lightweight.	4
6	The device's parts can easily be replaced if broken.	1
7	The device will not break if dropped or the user falls.	2
8	The device is easy to put on without the help of another person.	2

# Metrics

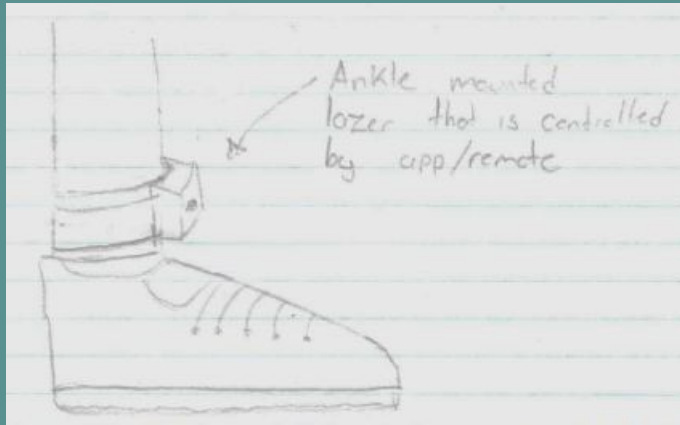
Metric #	Needs #	Metric	Imp	Units
1	1,5	Volume of the device.	5	cm <sup>3</sup>
2	3,4	Time it takes for the user to start walking once device is activated.	4	s
3	5,7	Weight of the device.	3	g
4	3,8	Time it takes for the user to put on the device	2	min
5	6,7	Strength of the parts	1	J
6	2	Material cost	4	CDN\$
7	4	Effectivity over Time	4	Scale 1-5

# Benchmarking

	Volume	Time to Work	Weight	Setup Time	Strength	Cost	Effectivity over time
Metric	1	2	3	4	5	6	7
Need #	1,5	3,4	5,7	3,8	6,7	2	4
Units	cm <sup>3</sup>	s	g	min	J	CDN\$	Scale 1-5
Spine Implement (Passive Treatment)	N/A	0	N/A	0	N/A	N/A	5
LaserCane	14748.4	<10	454	<1	N/A	\$199.0– \$239.00	2
Deep Brain Stimulation (Passive Treatment)	N/A	N/A	N/A	N/A	N/A	N/A	4
U-Step 2	10587- 187017	<15	13608	<1	N/A	\$575.0– \$879.00	3

*Note: Many current solutions are in development and are focused on passive treatment rather than a physical product that is triggered when the issue occurs, this is why many items in the benchmarking are marked as N/A.*

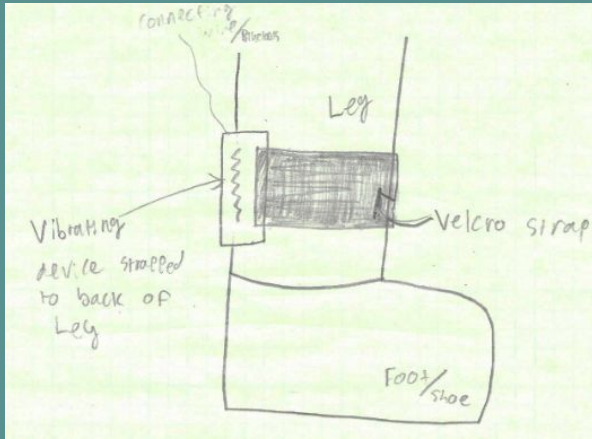
# Concepts



This is a laser mounted on a ankle band which emits laser pointers on the ground. This is proven to be a walking stimulus since this would motivate the patient to walk over the laser pointer every time the walk.

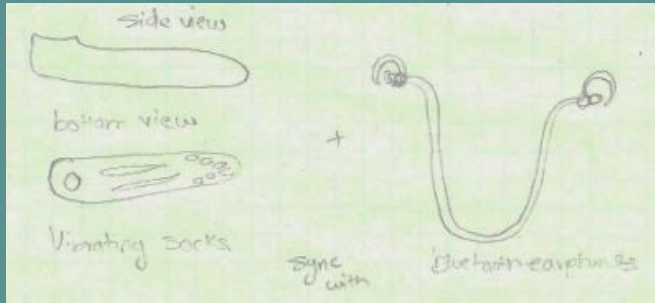


# Concepts



This is device that is also mounted on the ankle but except there is a vibrating device attached to it that stimulates the ankles resulting in the patient walking. The device is attached on a velcro strap so that it is convenient for the patient to put it on and off.

# Concepts



This is a vibrating sock that is sync with bluetooth earphones. The objective of this design was to stimulate the patient to walk by vibrating their feet. As they take a step their foot starts vibrating for 5 seconds and at that exact moment a beat is produced in the earphones. This design was based on the fact that audio stimulus is another working device that could motivate the patient to walk.

# Feasibility study

Selection Criteria	Weight Factor	Vibrating Shoe Insoles		Laser Cane		Audio Stimulus 1. Hearing aids 2. Headphones		Audio Visual Glasses	
Volume of device	0.25	5	1.25	4	1	5	1.25	4	1
Time it takes for user to start walking once device is activated	0.15	4	0.6	4	0.6	2	0.3	3	0.45
Weight of the device	0.1	4	0.4	5	0.5	4	0.4	4	0.4
Time it takes the user to put on the device	0.075	4	0.3	5	0.375	2	0.15	5	0.375
Strength of parts	0.025	3	0.075	4	0.1	3	0.075	3	0.075
Material cost	0.15	4	0.6	3	0.45	2	0.3	2	0.3
Effectiveness	0.25	3	0.75	4	1	2	0.5	3	0.75
<b>Total score</b>		3.975		4.025		2.975		3.35	

# Initial Project Plan

- **Rollie As the Client**
  - Does Not Use A Cane
  - Suggested A Visual Method
- **Two Initial Ideas**
  - Multiple stimulation methods in one solution
    - Audio Stimulus
    - Ankle Vibration
  - Modified Glasses
    - Visual Stimulus



# Client Meeting

- Irene experiences freezing Parkinson's
- She tries many methods to counter her freezing

## Working Methods:

- Stepping over a line
- Laser Cane
- CBD oils
- Foot nudging



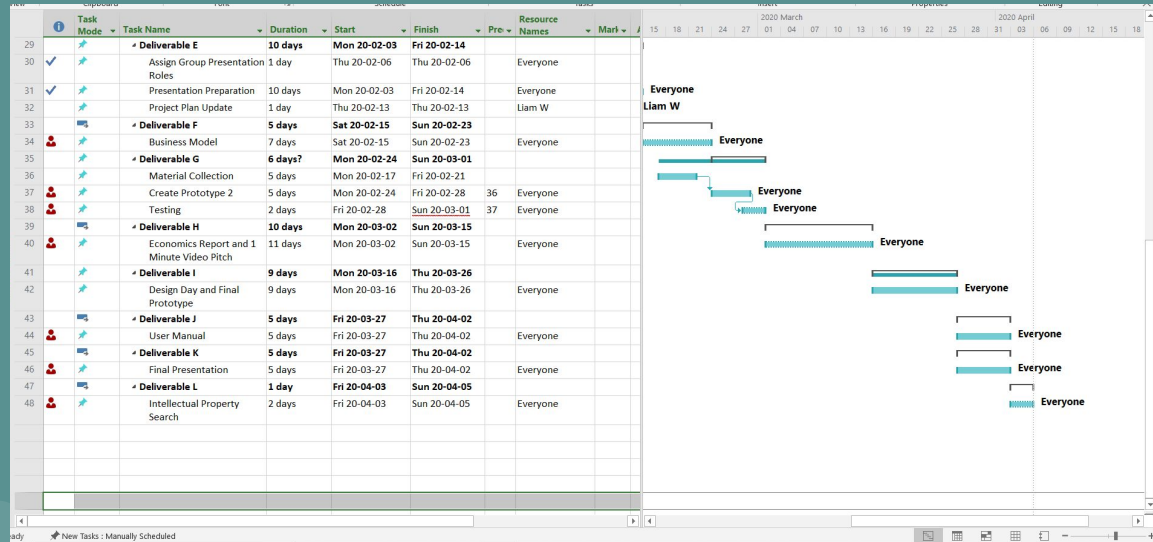
# Changes To Project Plan

- New Client Irene
  - Audio Not Known To Be Very Effective
  - Currently Has Multiple Other Methods
- Further Research
  - Budget Limitations
  - Skill Limitations



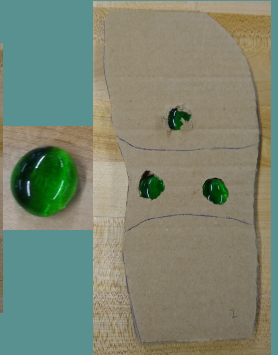
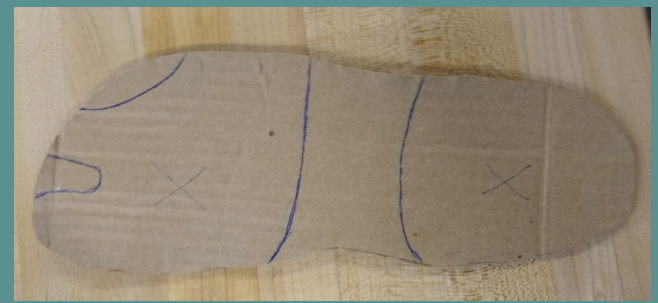
# Future Plan

- **Prototype 2**
  - Insole Vibration Device
- **Testing**
  - Irene Not Able To Test



# Prototype 1

- Used to test comfort and part placement with relation to comfort
- Constructed from cardboard, duct tape, and small glass gems
  - The cardboard functioned as the basic structure of the prototype
  - The glass gems served to represent the electrical parts like button cell batteries and vibrating motors.
- To test the prototype, it was placed inside of a shoe, and the general comfort of the device was assessed
- Additionally, a “tactile test” was conducted to test the ability of one's foot to sense vibrations through a shoe.





# Future Prototypes

- Using the proper placement of the motors learned from prototype 1, future prototypes will build and test subsystems.
  - Vibrating motors must be purchased and integrated into a pair of shoe insoles.
  - A control system must be developed.
    - Current designs are set to use an arduino uno.
- Designs for prototype 2 are currently under development.
  - Prototype 2 will be the integration of the motors and shoe insole.
    - Parts will be purchased within the next week.
    - Construction of prototype 2 will begin as soon as the parts arrive.
- Prototype 3 will integrate arduino control into prototype 2.
- Due to the lack of a client to test prototypes with, all prototypes will be tested on various group members.
  - Using information gathered from the client meetings, the group will analyze the success of any prototypes.

