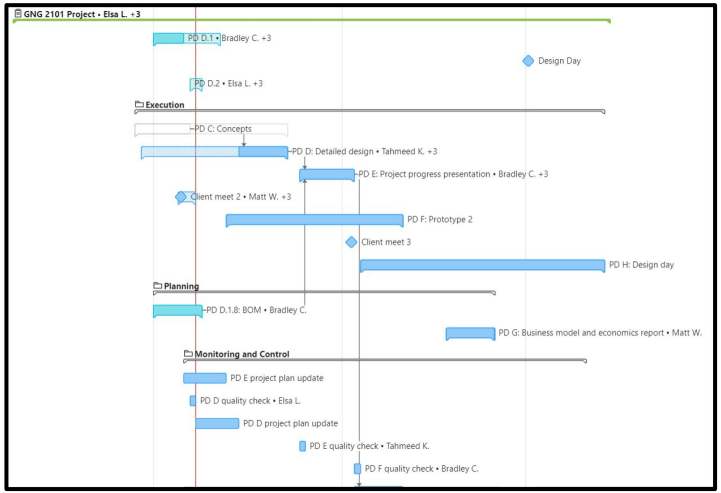
BRAKEthrough Solutions

Take a Brake!

Group 8

Deliverable A

- Team Contact
- Interview Guide
- Wrike Chart



Backstory

Current Situation

Gait Trainer Function

Who is the intended user?

What setting is this commonly used in?

How should someone control the brake?

Problems

- Interview planned Sept. 15th, one week after interviews carried out
  - One week delay in the project
- One group member dropped course
  - Re-assign all tasks to four people

Gait Trainer

Need Statements

"My biggest concern for my son is his safety. I don't want him to get hurt by the device."

The braking system is safe and reliable.

"I want a system that allows my son to socialize and move independently without having to have a parent or guardian an arms length away at all times."

The braking system can be activated from a distance.

“The client needs a safe and reliable remote braking system for his son’s pediatric gait trainer, the R82 Crocodile. It can be activated from a distance to let him practice walking independently—most existing brakes are manual and require the guardian to be within arms reach. This will be achieved by having a Bluetooth remote activation of a mechanical spring-based friction braking.”

Metrics

Metric	Units	Client Statements
Functional Requirements		
Braking Distance	Metres (m)	The braking system is safe and reliable.
Non-Functional Requirements		
Mass	Kilograms (kg)	The system is adaptable to multiple versions/models of gait trainers and users
Constraints		
Cost	CAD ($)	N/A

Technical Benchmarking

Product and company	Importance (weight)	Rollator Brakes	Grillo Gait Trainer Brakes	R8 Crocodile Hand Brake	Rifton Pacer Gait Trainer: Rifton Casters
Activation Method	3	1	2	1	2
Function	2	3	2	2	1
Cost	1	3	2	2	1
Total		12	12	9	9

Target Specifications

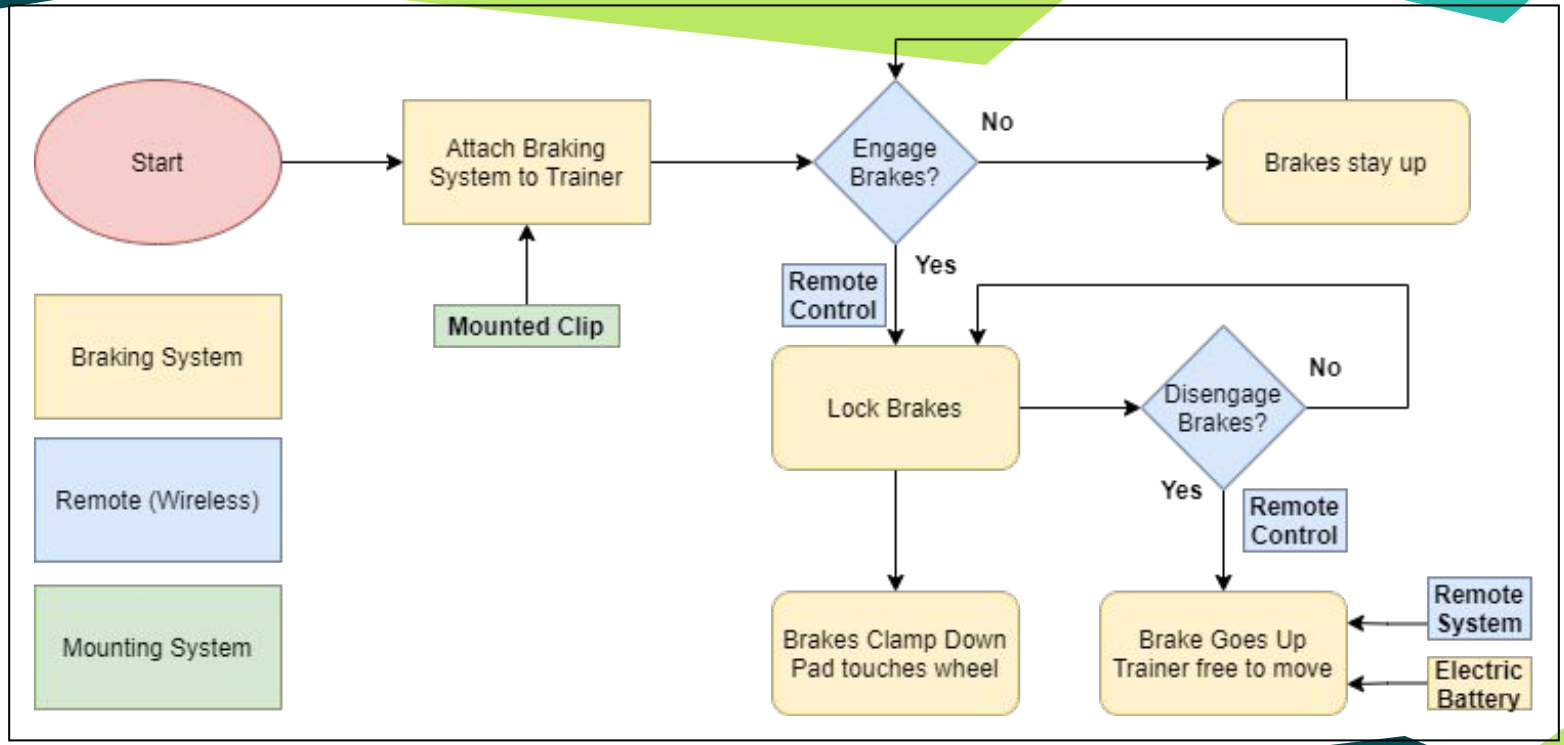
Design Specifications	Relation (=, < or >)	Value	Units
Functional Requirements			
Braking Distance	<	Ideal: 1 Acceptable: 2	m
Non-functional Requirements			
Mass	<	Ideal: 3 Functional: 5	lbs
Constraints			
Cost	≤	Ideal: 100	CAD

Deliverable C

System - Subsystems

- Braking Mechanism
  - Stopper, Piston, Material
- Remote Controller
  - Bluetooth, Buttons, etc
- Mounting System

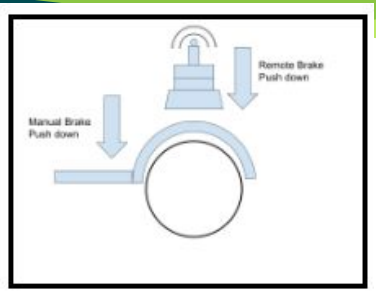
Functional Decomposition Flowchart

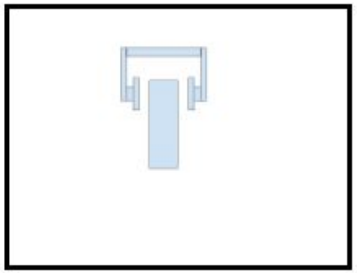


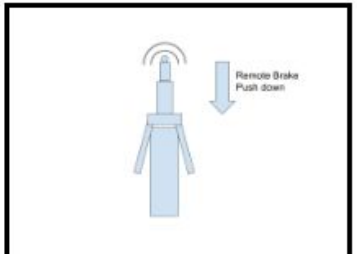
Design Criteria

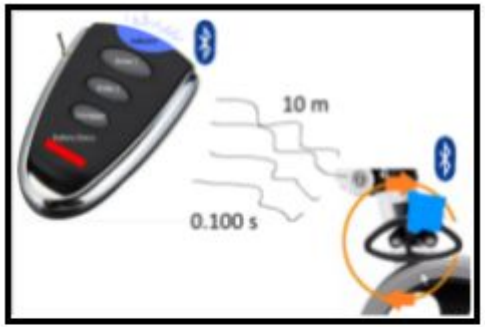
- Safety
- Durability
- Remoteness
- Portability
- Environmental Versatility
- Braking Dynamicity
- Adaptability

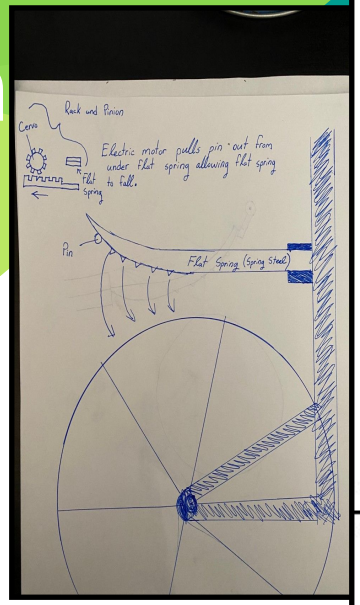
Design Concept Ideation

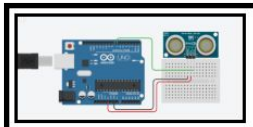


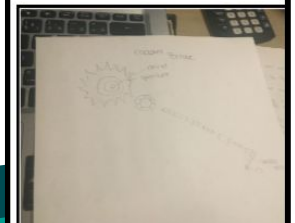


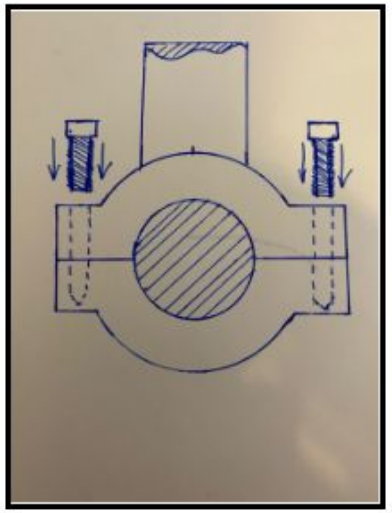


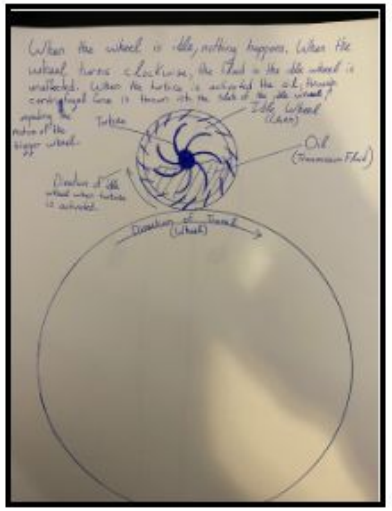






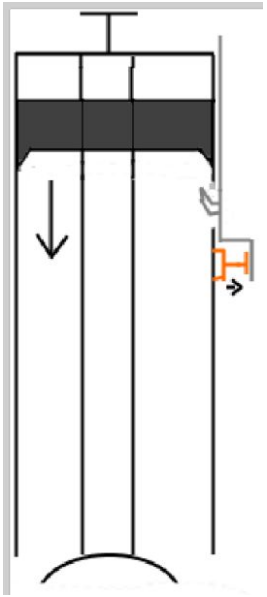






Initial Prototype

The initial idea was a “mechanical” design.



What is It?

- 3D Printed Model
- Low Fidelity
- Non Functional
- Intended to gain client feedback

How Does It Work?

- Entirely Mechanical
- Uses Potential Energy
- Is Non-Variable
- Prevents Any Movement
- Manual Reset

Client Meeting 2

Question: We have designed a system that is not dependent on a full battery life. Would you be against a system that is?

"As long as it shouldn't drain the battery after charging overnight, it can be dependent on battery and would have to include an indicator on battery life."

Question: Do you have any suggestions or concerns regarding the shape or function of the initial design?

"Forward and backward motion is not essential but would be nice."

"Must be portable and should remain on the gait trainer when folded."

Deliverable D

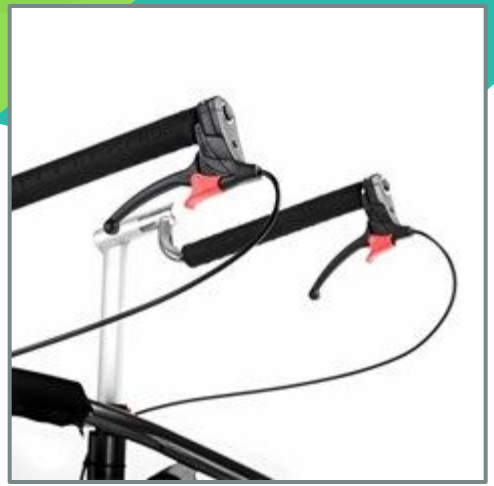
- Summarize Client Feedback
- First Prototype Description
- Bill of Materials

Item	Description	Quantity (Approx.)	Price	Source
Aluminium Flat Bar	Used to make a mounting system for the brake.	3’ ($0.11/ft)	$3.96	Makerstore
Micro Linear Actuator/Push Pull Solenoid	Used to engage and disengage brakes.	1	$25-$30	Makerstore
9V Battery	It’s a battery!	1	$1-$4	Makerstore https://makerstore.ca/shop
Bluetooth HC-05	Allows for bluetooth communication using Arduino	1	$12.99	MakerLab
12V Battery	Again, it’s a battery.	1	$8.95	Amazon https://www.amazon.ca/Energizer-A23-GP23AE-Alkaline-Batteries
Arduino Nano	Used for logic and communication.	2	$8.00	MakerLab
Total			59.9-67.9	

Prototype 2 Ideation

- Old braking mechanism unsatisfactory
- Variable Braking, Reverse Braking and Full Remoteness must be prioritized.
- A new idea must be brainstormed

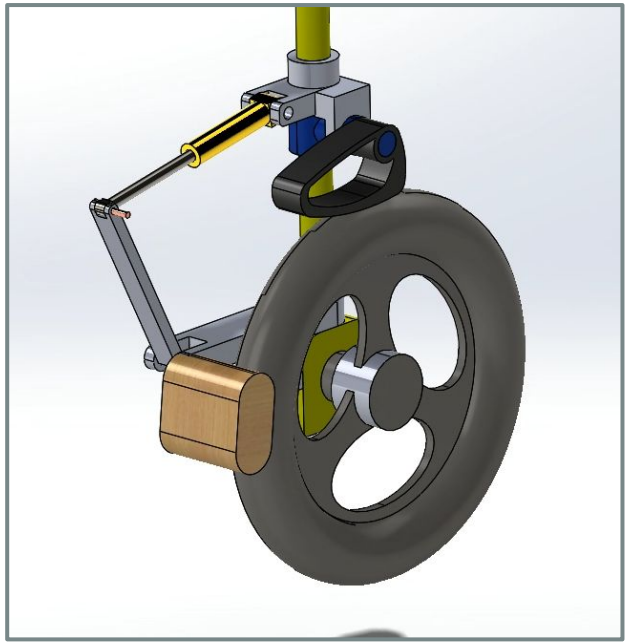
Prototype 2 Ideation



- Modify existing Hand Brake
- Use lever + mechanical advantage with a linear actuator
  - Plus reverse stopper toggle

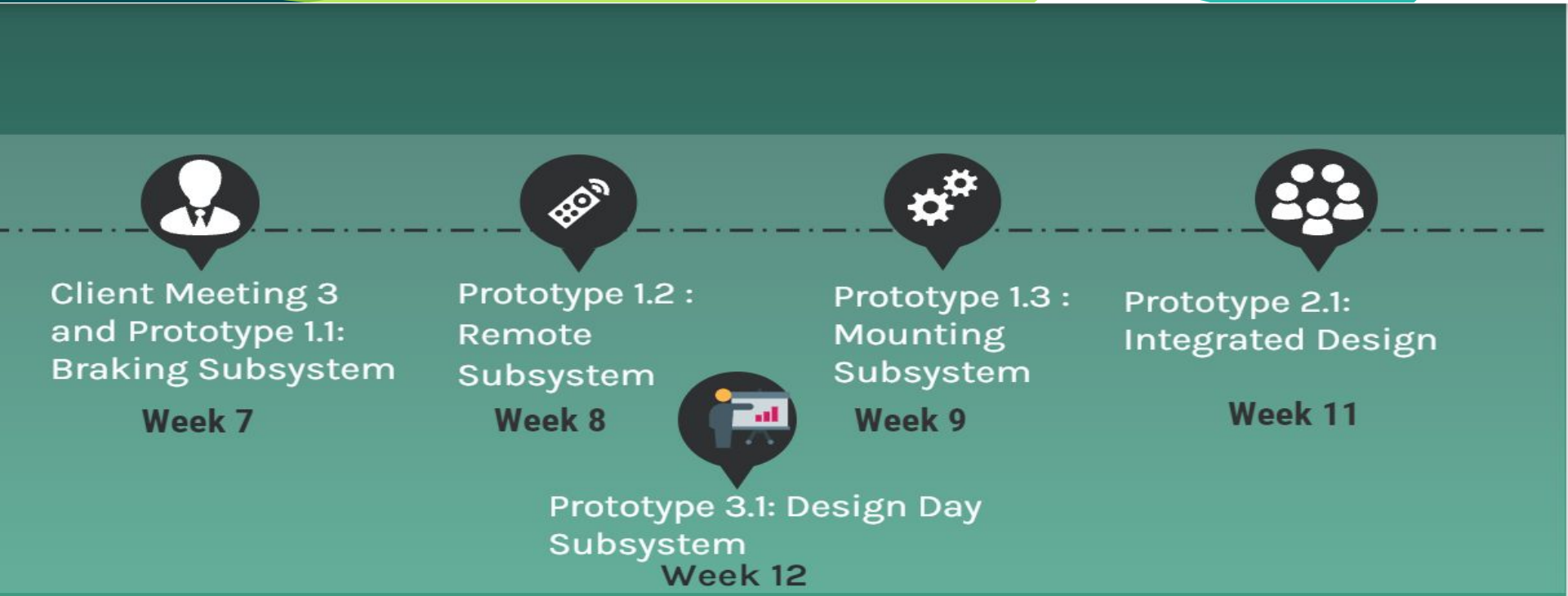
Prototype 2, The “Lever”

Engaged



Disengaged

Action Plan


Client Meeting 3 and Prototype 1.1: Braking Subsystem
Week 7
Prototype 1.2 : Remote Subsystem
Week 8
Prototype 3.1: Design Day Subsystem
Week 12
Prototype 1.3 : Mounting Subsystem
Week 9
Prototype 2.1: Integrated Design
Week 11

Conclusions

- Refined knowledge about Design Process
  - Creating and prioritizing design criteria
  - Generating with new ideas and evaluating them under client requirements
  - Working under tight deadlines
- Functional Prototype next week

Thank you for listening.