

GNG2101 Deliverable B

Deliverable B: Needs, Problem Statement, Benchmarking, Metrics and Target Specifications

Submitted by

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1 Introduction

On May 14th, our group was approached by a member of the TETRA society, who was representing the client, to discuss a need for an improved braking system on a walker. One of his clients could not fully utilize one side of his body, and furthermore, had minimal grip strength and required a walker to move around. However, since the right side of his body was unable to function normally, he could not activate the brakes of his walker properly. This is because he could only grip one side of the walker brakes, resulting in his walker spinning whenever he tried to stop the walker. The TETRA member also informed us about a second client with a similar issue who has a condition which affects her mobility due to a reduction in muscle and tissue strength. As a result of her condition, she is unable to walk on her own or grip objects properly and needs a walker to get around. However, she could not grip the brakes properly as her grip strength was weak. Based on the conversation with the TETRA member, Paul Marriage, we were asked to design a walker braking system that could be operated with minimal grip strength and that can stop both rear wheels of a walker with only a single interaction point.

The basic user requirements of this walker braking system that our group is designing, are that the brakes must be activated using only one hand and it cannot use any mechanism that requires a high grip strength. Some additional requirements are that the walker should still be foldable even after the brake attachment is added onto it. Also, excess weight will not be added to the walker so that it maintains its portability.

Some of the key aspects that make our group's project unique include the brakes being activated with minimal grip force with only one hand. It may also be possible to place the one hand interactive component on either side of a walker, so that our clients will get extra bang for their buck!

This report is focused on the clients' needs, as well as the benchmarking done to find comparable products and come up with specifications for our design product, using the metrics that we developed via the interpreted client needs.

2 Client Statements and Observations

We met with Paul, a representative of our clients, on Friday May 14th via zoom. We discussed with him in detail about what the clients desire for this project. During this discussion, we also asked different questions about walker braking systems and about the modifications that could be made to help our clients. We compiled the following list of statements.

1. Paraphrased Client Statements

The first client has a paralysis on the right side of his body. The second client had limited mobility and a very low grip strength. Both clients need a walker with a one handed braking system which can be activated with minimal force. Here are some of the specifics expressed during the meeting:

- They want to be able to activate the brakes with one interactive component.
- The brakes need to be activated using little to no gripping strength.
- The system needs to have a low force threshold.
- The walker needs to come to a gradual stop.
- The braking system needs to be waterproof/weatherproof.
- The braking system needs to be foldable.
- The walker needs to be safe for the user.
- The walker needs to be as light and portable as possible for the user.
- The walker needs to be able to fit in a car.
- They do not want to modify the structural integrity of the actual walker, which would cause an unsafe condition and void the manufacturer's warranty.
- If the braking system is electric, there needs to be a failsafe mechanism so the user can still use the brakes.
- They want ergonomic features such as having a braking mechanism close to the handle.

- They would like for the braking system to be interchangeable depending on the user's dominant side.
- They would be interested in a quick stop option.
- They would like to see if a push down brake rollator would be an option.
- They would like to see if push down brake mechanism or a button/pressure switch is an option to activate the brakes.
- They want to feel comfortable using their walker.
- They don't want to reach down for a lever to activate the brakes.

3 List of Prioritized Needs

Following the conclusion of our client meeting, we have come up with the following list of needs. We have rated them on a scale of 1-5, where:

- 1 = need is not important or relevant;
- 2 = need would be nice, but is not important or essential;
- 3 = need would be nice, but is only mildly important and not essential;
- 4 = need is important but not essential;
- 5 = need is important and essential.

Table 1: List of needs

ID	Need		Rating
1	The walker brake	has an interactive system that requires limited hand gripping strength.	5
2	The walker brake	system that has a low force threshold.	5
3	The walker brake	only has one interactive component needed to be able to stop both sides of the walker.	5
4	The walker brake	comes to a gradual stop.	5
5	The walker brake	is waterproof/weatherproof.	4
6	The walker brake	is foldable.	3
7	The walker brake	is safe for client use.	5
8	The walker brake	is light and portable as possible.	4
9	The walker brake	has to fit in a car.	3
10	The walker brake	retains the structural integrity of the actual walker.	5
11	The walker brake	has a failsafe mechanism.	5
12	The walker brake	has ergonomic features such as having a braking mechanism close to handle.	3

4 Problem Statement

Based on the needs of our clients, we have created the following problem statement which will help us with the rest of the design process.

The clients require a safe, universal braking system to stop the motion of a walker gradually while using minimal grip strength and a single user interface. The brake system needs to be lightweight, ergonomic and foldable without altering the structural integrity of the walker.

5 Benchmarking Tables

Table 2: Benchmarking Walkers

	Piper Series Walker by Evolution Walkers	Glider Plus Adjustable Rollator	Rollator Walker by KMINA PRO
Product and Feature			
Cost	US\$439.35	£195	\$149.99
One handed braking system	Yes	Yes	Yes
Lightweight	Yes (12 lbs. for smallest size)	Yes (6.5 kg, 14.3 lbs.)	Yes
Foldable	Yes	Yes	Yes
Failsafe mechanism	No	No	No

Brakes can be activated with low grip strength	Yes	Yes	Yes
Lockable brakes	Yes	Yes	Yes
waterproof/ weatherproof	Yes	Yes (Optional Add-On)	Yes
gradual stop	Yes	Yes	Yes
Link	https://us.evolutionwalker.com/index.php/blockgen/index/itemwalker?act=itemConfigPage&itemNum2Char=WP https://www.evolutionwalker.com/product-detail/product_type/accessories/items/one-hand-brake-system.html	https://data.dlf.org.uk/product.php?product_id=0011276&groupid=1946	https://www.amazon.com/KMINA-Walker-Black/dp/B07C3X2J15/ref=pd_lpo_121_t_0/138-1302614-4104939?encoding=UTF8&pd_rd_i=B07C3X2J15&pd_rd_r=088e2b3f-18df-4409-8ca8-89d0807660ef&pd_rd_w=BEbD3&pd_rd_wg=FTA9e&pf_rd_p=a0d6e967-6561-454c-84f8-2ce2c92b79a6&pf_rd_r=RKBVFX2EKQSC4QVMYSV6&psc=1&refRID=RKBVFX2EKQSC4QVMYSV6

6 Metrics with Associated Units

To rate our metrics, we use the same scale of 1-5 as used for rating the needs.

Table 3: Metrics with Associated Units

Metric ID	Need ID	Metric	Rating	Units
1	8	Total weight of the walker	4	lbs.
2	6, 9	Dimensions of walker (l x w)	3	in
3	4	Stopping distance	5	in
4	1, 2	Load exerted to brake	5	Low/High
5	11, 12	Size of braking mechanism	3	in
6	N/A	Cost	4	\$CAD
7	3, 12	One-hand interaction with brake	5	Yes/No
8	5	Weather resistance / Waterproof	4	Yes/No
9	7, 10	Safe for client use	5	Yes/No
10	6, 9	Height of handles	3	in

7 Set of Target Specs

Table 4: Target Specs

Metric ID	Need ID	Metric	Units	Marginal Value	Ideal Value
1	8	Total weight of the walker	lbs.	13	<15
2	6, 9	Dimensions of walker (l x w)	in	22 x 23	N/A
3	4	Stopping distance	in	-	12
4	1, 2	Load exerted to brake	Low/High	-	Low
5	11, 12	Size of braking mechanism	in	-	<22 x <23 x <31
6	N/A	Cost	\$CAD	-	<100
7	3, 12	One-hand interaction with brake	Yes/No	Yes	Yes
8	5	Weather resistance / Waterproof	Yes/No	Yes	Yes
9	7, 10	Safe for client use	Yes/No	Yes	Yes
10	6,9	Height of handles	in	31	31.5

1. Reasons for our Choices

The above values for our target specifications are based on the benchmarking table and the needs of our clients. The clients want both of the brakes of their walker to be safe, waterproof, and activated by one hand. The marginal value of 13 lbs. and the ideal value of 15 lbs. was chosen for the total weight because we need the walker to be lightweight and portable for the clients. Also, the ideal value of 12 inches was selected for the stopping distance, because the clients want the brakes of the walker to be activated gradually. The marginal values of 22 x 23 inches were chosen for the dimensions because the clients want their walkers to be foldable with the brakes. The ideal cost of the walker should not exceed \$100 because of our budget. Ideal size of the braking mechanism was chosen to be 22 x 23 x 31 inches. This is so that we don't add too much weight on the walker and so that the clients can fold the walker. Lastly, the marginal and ideal values for height handles were chosen as 31 inches and 31.5 inches, respectively, so that the clients can apply a low grip strength and be able to reach the one hand interactive component easily.

8 Reflection of Client Meeting

Prior to meeting with the clients' representative from the TETRA society, the team was originally focused on designing a walker braking system to be used solely based on a single client with the loss of mobility on one side. During the interview, we discovered that a second client with mobility issues and a lack of grip strength also had a similar need. Based on this new information, we will need to develop a design that will satisfy the needs of both clients by providing a method of braking the walker using one hand as well as with little to no grip strength.

9 Conclusions

In conclusion, after meeting with our client, the team was able to develop a list of needs based on the client's requirements. Once the needs were identified, they were then ranked based on importance to establish a problem statement that would act as a foundation for the project moving forward. Benchmarking of similar available solutions in the market was then performed based on these needs so that a target specification could be developed. Using the data generated and collected in this deliverable, our group will be creating a conceptual design of our product and we will generate a product plan for our final product.