

**Project Deliverable B**  
**Needs, Problem Statement, Metrics, Benchmarking, and Target Specifications**

A2.2 - One-Handed Walker Steering

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## Abstract

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Our client, Janice, is an individual with a variety of health issues leading to mobility impairment, including hypermobility syndrome, myopathy, and epilepsy. This combination has left Janice dependent on a walker, but due to frequent dislocations of both her shoulders and spine, as well as other appendages, this fix alone is insufficient as she is frequently unable to steer with complete control, which poses a risk to her safety. She is in need of a system that will allow her to steer the walker efficiently with only one arm, that is transferable to be used with either arm, and is easy to install, operate, and maintain. The goal of this deliverable was to empathize with the client and develop a thorough understanding of her needs and the problem to be solved, both through listening to her responses and inferring what she may not have been able to effectively communicate. The group was tasked with creating a problem statement, benchmarking three different products already on the market, developing a list of metrics with associated units, and defining target specifications. Upon reflecting on the client meeting to translate and prioritize her needs, the group articulated what the problem was, who has the problem, and the ideal solution form in a concise problem statement. Our benchmarking consisted of a variety of walkers and walker steering products that satisfied at least some of the defined needs, as no product had yet been created with these specific needs in mind. A list of metrics, which are measurable design criteria, with associated units were then created based upon Janice's identified and translated needs. By narrowing down the customer's needs, the group also created a set of target specifications, with both ideal and marginally accepted values, in order to measure the success of the project moving forward. The overall goal of the deliverable was to create a foundation of knowledge regarding the client's wants and needs, to incorporate into our future design concepts based on feasibility and prioritization. Upon compiling this basis regarding Janice's needs, we were left with a strong understanding of the project requirements to ensure that we can invest ourselves in creating a variety of concepts, and finally a strong solution, to the correct problem.

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# 1. Introduction

In the accessibility field, many technological advancements have been made for those with complete mobility impairments, and yet it has remained stagnant for individuals with partial mobility impairments. This is likely due to the increasing accessibility and scope of technology in the medical field over the years, and since accessibility devices for partial mobility impairments are more dependent on basic engineering designs with a focus on stability, it is an area that has been left overlooked. Even the most recent solutions for such impairments are simple walkers, often a foldable design with a seat, four-wheel drive, and a two-handed steering mechanism. Thus, a great need is left for those who require additional assistance due to niche combinations of mobility impairments. In this case our client, Janice, is unable to properly utilize the two-handed steering mechanism on her walker due to a hypermobility syndrome that causes her shoulders to frequently dislocate throughout the day and consistently leaves her with one arm in a sling. She has expressed a desire for a device that will allow her to steer her walker with one hand and can be temporarily attached to any basic model. Her end goal is to be able to safely direct her walker with either hand individually, requiring it to be a versatile design that can primarily be used with either hand, as well as be easily added to and removed from any walker, as she often changes between models and brands due to their short lifespan, without requiring any permanent alterations to the walker.

As we are currently in the early stages of our product development, we have thoroughly analyzed the stated and inferred client needs, researched similar products on the market, and compiled lists of metrics and defined target specifications. We are still open-minded to a variety of different solutions but have decided to place our main focus on a device that will be able to connect the existing walker handles in order to create a single handle that Janice will be able to use with either hand. With this product, we would like to ensure that she will be able to smoothly steer the walker, have a good handle grip that will not slip in any harsh weather and will avoid any potential safety risks such as pinching her skin in any movable parts. Our overall goal is to create a versatile and sturdy design that will not only meet all her required needs but will also exceed her expectations.

The development of this product will not only benefit Janice and those with a similar combination of mobility impairments, but also those around them. It will allow Janice and many like her to complete tasks that many others take for granted with more ease, like taking her kid to

the park or going grocery shopping independently. This one-handed steering device will be the next step in innovation that the accessibility industry can take to create equality between everyone, no matter their physical state.

## 2. Client Statements, Translated Needs, and Problem Statement

### 2.1. Client Statements and Observations

Table 1 - Client statements from the meeting

#	Client Statements
1	I go through a lot of different walkers over time.
2	Using the walker during the winter can get complicated.
3	I usually have to hold a flashlight while walking at night and it gets hard holding both the handle and the flashlight.
4	The handles can get slippery and hard to grasp.
5	I need a walker that is easy to store and can be compact.
6	It can get uncomfortable using the handles while having an arm in a sling.
7	I need room for groceries in the walker
8	I need an affordable walker.
9	I have very weak lower body strength so I cannot do sharp turns.
10	I often dislocate either shoulder and must put it in a sling.
11	I like it when the wheels in the front are bigger than the back ones.

## 2.2. Translated and Prioritized Customer Needs

Table 2 - Translated client statements and prioritizing.

#	Translated Needs	imp (1 least - 5most)
1	Solution should be versatile, and applicable to different kinds of walkers.	5
2	The walker can be used during winter.	3
3	Walker can be used in the dark.	2
4	Handle has a good grip.	3
5	Easily foldable.	4
6	The handle height is adjustable.	3
7	The steering device should not take up a lot of space on the walker.	2
8	The walker is low cost.	2
9	Walker needs to be easy to steer.	4
10	Handle can be used by either hand.	5
11	Wheels can be bigger in the front.	3

## 2.3. Problem Statement

There is a need for a product that allows customers with disabilities to use and steer a walker one-handed through a long-lasting design that can be controlled by either hand and is compatible with various kinds of walkers.

### 3. Metrics, Benchmarking, and Target Specifications

#### 3.1. Metrics and Units

Table 3 - Metrics

# M	# N	Metric	IMP	units
1	2	Tire rolling resistance	3	N
2	3	Light intensity	2	cd
3	4	Sheer force	3	N
4	6	elevation of the handle	3	cm
5	8	Price	2	\$
6	9	Weight	4	kg
7	11	Diameter of the front wheel	3	cm
8	1	Space between handles	5	cm

### 3.2. Benchmarking

Table 4 - Benchmarking Existing Products

# MET	# NEEDED	Metrics	IMP	UNIT	Rollator with 7.5" Casters [1]	Gemino 30 Walker Lightweight Rollator [2]	Human Care Carl Oskar RA Forearm Rollator [3]
1	2	Tire rolling resistance	3	N	2.7	4.5	7.89
2	3	Light intensity	2	cd	N/A	N/A	N/A
3	4	Sheer force	3	N	20	10	25
4	6	Elevation of the handle	3	cm	78.74-93.98	83.82-99.06	106.9-125.98
5	8	Price	2	\$	159.99	925	1270
6	9	Weight	4	kg	9.07	9.07	13.15
7	11	Diameter of front wheel	3	cm	20	25	30
8	1	Size between handles	5	cm	43.18	25.4	49.5

### 3.3. Target Specifications

Table 5 - Marginal and Ideal Values Based Off Benchmarking

# M E T R I C	Metric	Units	Marginal Value	Ideal Value
1	sheer force	N	15	20
2	elevation of the steering device	cm	106	125
3	price	\$	50	39.9
4	weight	kg	1	0,500
5	light intensity	cdn	20	10-20
6	light frequency	Hz	5	3-5
7	length	cm	46	49

#### 3.3.1 Justifications

Sheer force: This represents the force parallel to the surface that the device must be able to withstand. The device must be able to withstand the same or a slightly less amount of pressure compared to the regular walker handles for a midrange model.

Elevation of the handle: the client expressed the need for the designed handle to be slightly elevated for more comfort, therefore, we are aiming for a total height similar to a steering device that is on par with the bigger models currently on the market.

Price: Ideally, we want the price of the designed product (not development cost) not to exceed a quarter of the price of a low-end walker, this seemed acceptable as the product is an add on.

Weight: Our research showed that the various products on the market strive to be as lightweight as possible, hence through basic calculations we determined that by using lightweight materials, we should be able maintain a weight that does not exceed 1kg.

Light intensity and frequency: Our benchmarking revealed that most models did not have integrated lighting installed on them. Keeping in mind that our client is prone to epileptic seizures we chose values that present insignificant danger regarding her condition.

Length: This value was chosen by looking at the average width between the handles for the walkers benchmarked (the width value for the second benchmarking model was ignored due to the fact that it has a very large handle design that is not representative of what our client might use on a daily basis). We want our product to be as adaptable as possible as it was stated by our client that she rapidly moved through different walkers, therefore, our end product will likely be adjustable for a range of different lengths.

## **4. Conclusion**

Upon empathizing with the client and developing a thorough understanding of her needs and the problem to be solved, our team has created a solid foundation on which we can build successful project concepts, and eventually a successful final prototype. This includes the creation of a concise problem statement, the benchmarking of three similar products, the development of a list of metrics with associated units, and the definition of our target specifications. Moving forward, this data will be used to create a range of prospective concepts and designs for our prototype. We now have a distinct picture of the necessary features to create a successful device to meet Janice's needs and will develop a conceptual design for our product and a plan for completing multiple prototypes in our next deliverable.

## 5. Bibliography

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## 6. Wrike Link

<https://www.wrike.com/open.htm?id=963685589>

