Scoring Criteria

Safety (25%) - Safety is one of the most important criteria of the design, as it is imperative that the user faces no risks of injury while using this device. The design should be able to hold the weight of the user and gait trainer without risk of collapsing, while also ensuring that the wheels of the gait trainer cannot roll off the edges, especially in case of a seizure occurring while the device is in use. A higher score in this category would indicate that the design offers a safe way to wheel the gait trainer up a ramp, and safely be locked in place over the area of the treadmill belt.

Ease of Set Up (25%) - Another important factor in the design is the ease of set up. The client mentioned that the previous prototype is very rarely used. This is primarily because it is difficult to move due to the lack of a handle, and it is also difficult to attach to the treadmill using the C-clamps. The main goal of this new design is to create a device that is easier to set up and attach to the treadmill so that it can be used more frequently. Ease of set up is weighted at 25% because this is the main concern of the clients. A high score in this category means the design presents an easier way to attach the device to the treadmill that could easily be repeated, or presents a method of permanently attaching the device to the treadmill.

Weight of Device (15%) - Another contributing factor to the lack of use with the previous prototype is the weight of the device. The previous design was fabricated with wood, making it very heavy to move around. The client has indicated they would prefer something more lightweight than wood, especially if the device will need to be attached and unattached to the treadmill repeatedly. The device should ideally weigh less than 23 kg if it will need to be moved in order to be attached to the treadmill. This category is weighted at 15% because this is another main concern of the clients. A higher score in this category means the design presents a lightweight material that can be more easily moved around.

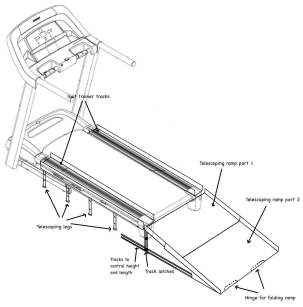
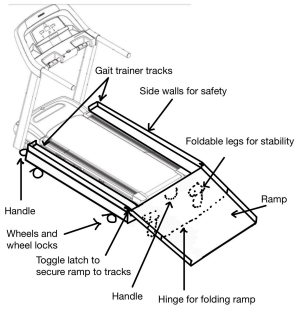
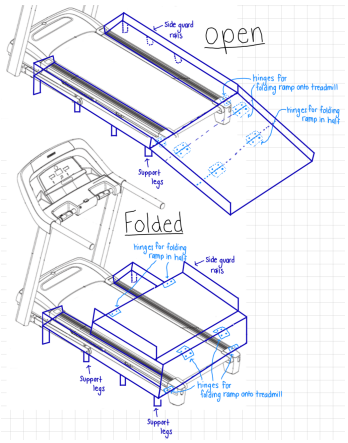
Compactability (15%) - The clients would prefer a design that takes up less space than the previous prototype. The design should be able to be folded onto the treadmill, or be completely removed from the treadmill and be compactly folded on itself for easy storage. Compactibility is weighted at 15% because the clients also stressed the importance of it being able to fit in their living space. A higher score in this category means the design can easily be folded into smaller dimensions to take up less space in the user's home.

Ease of Fabrication (10%) - Ease of fabrication considers how easy each design is able to be fabricated, including the accessibility to materials and ease of machining. It is only weighted at 10% because there is considerable access to materials and resources for coming up with a practical fabrication plan. A higher score in this category means the design can be easily fabricated using the resources available to the team.

Adjustability to Other Treadmills (5%) - The clients are hoping the design may be adjustable to the dimensions of other treadmills in case the treadmill were to malfunction. This category is only weighted at 5% because it is not the main concern of the client. A higher score would indicate that the design can easily be attached to the dimensions of a new treadmill.

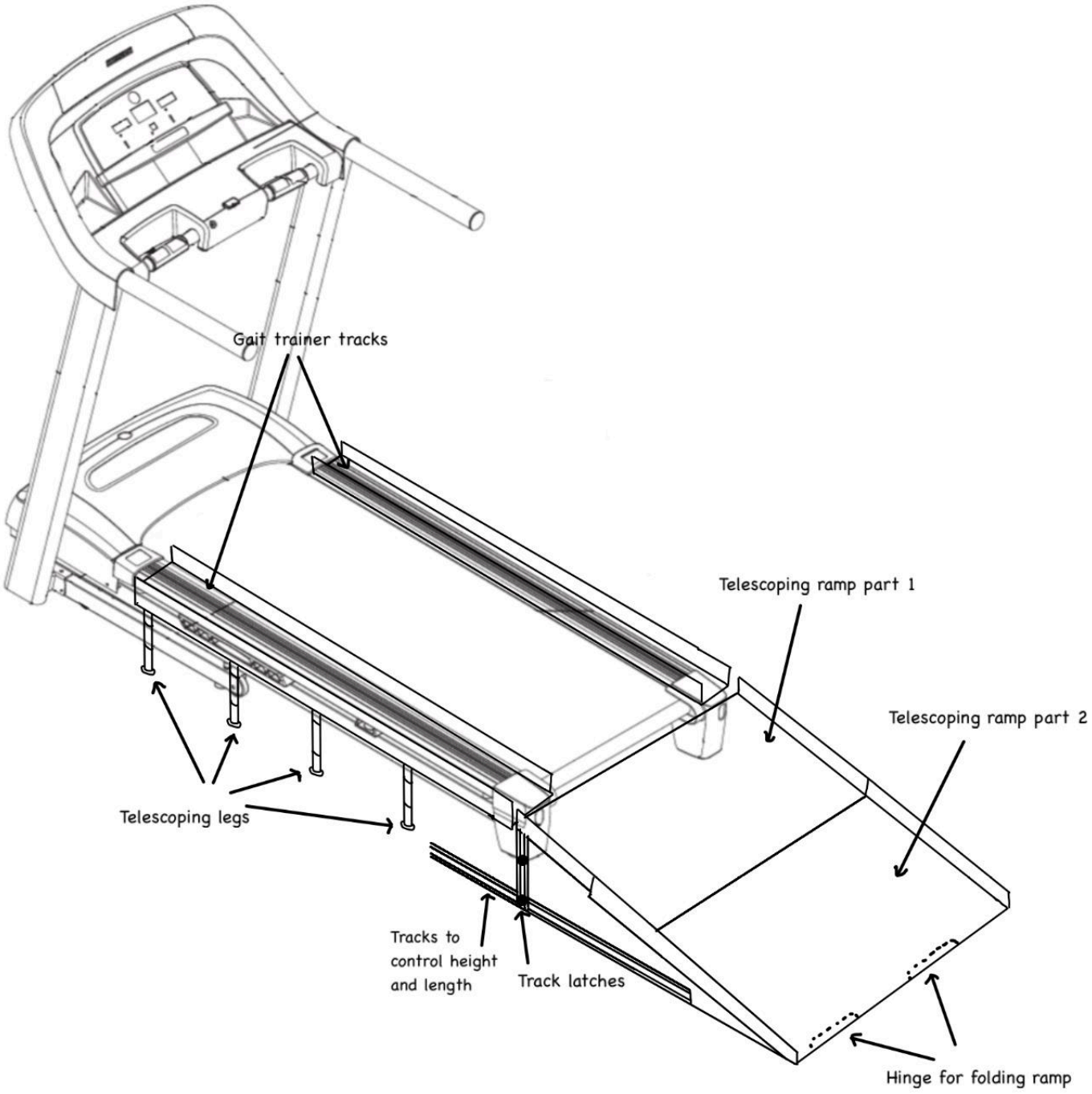
Cost (5%) - Cost considers the amount of money needed to fabricate the design. This category is only weighted 5% because the clients are flexible with the cost and it may be adjusted based on the necessity and functionality of the product. A higher score would indicate that the design is less expensive.

Design Matrix Table

	Design 1: Telescoping Ramp	Design 2: Suitcase Ramp	Design 3: Folding Ramp
			

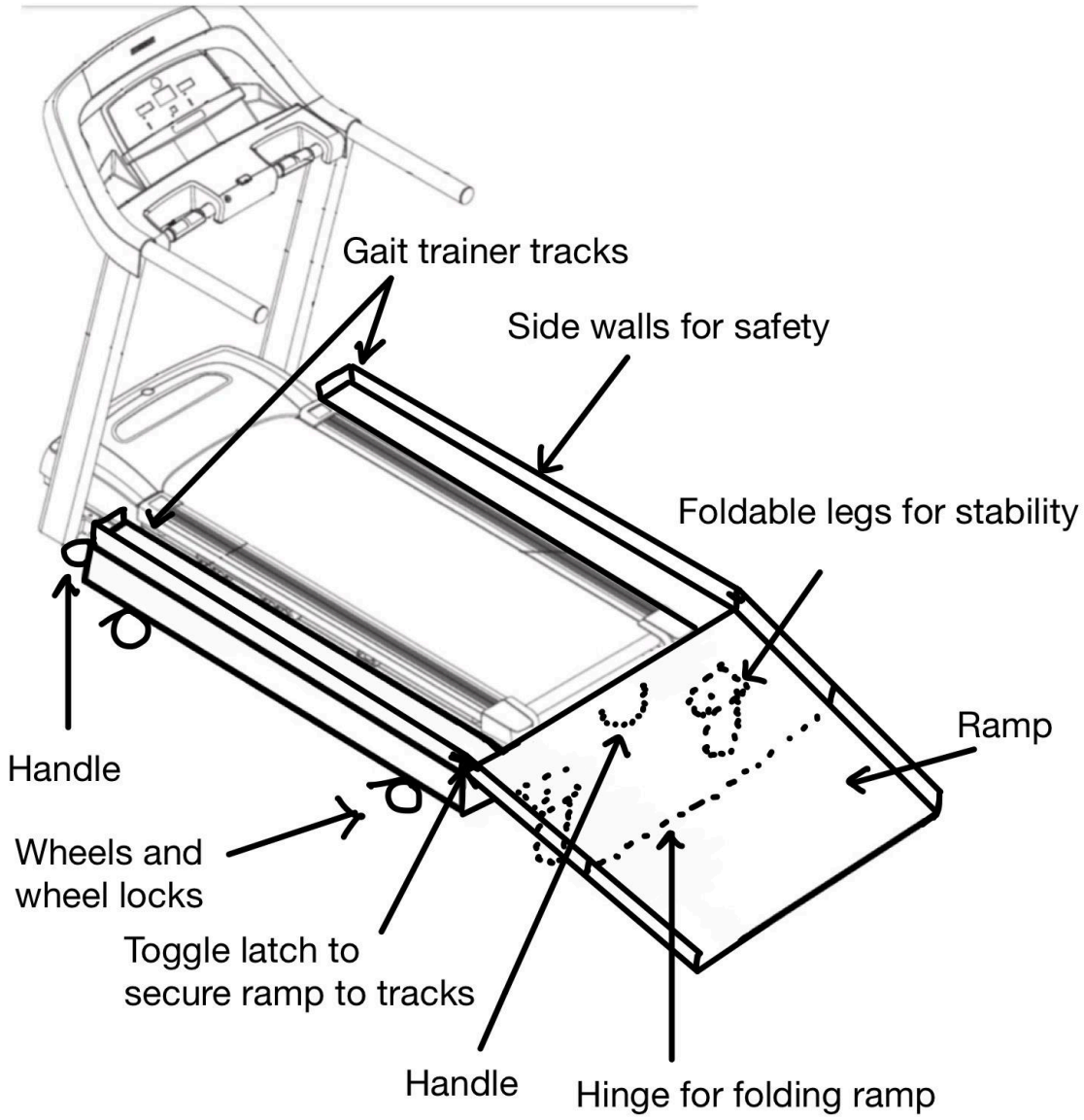
Criteria	Weight	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score
Safety	25	3/5	15	4/5	20	4/5	20
Ease of Set Up	25	3/5	15	3/5	15	3/5	15
Weight of Device	15	3/5	9	4/5	12	3/5	9
Compactability	15	4/5	12	4/5	12	4/5	12
Ease of Fabrication	10	3/5	6	4/5	8	3/5	6
Adjustability to Other Treadmills	5	4/5	4	2/5	2	2/5	2
Cost	5	2/5	2	4/5	4	3/5	3
Total	100	63		73		67	

Design 1: Telescoping Ramp Full Image



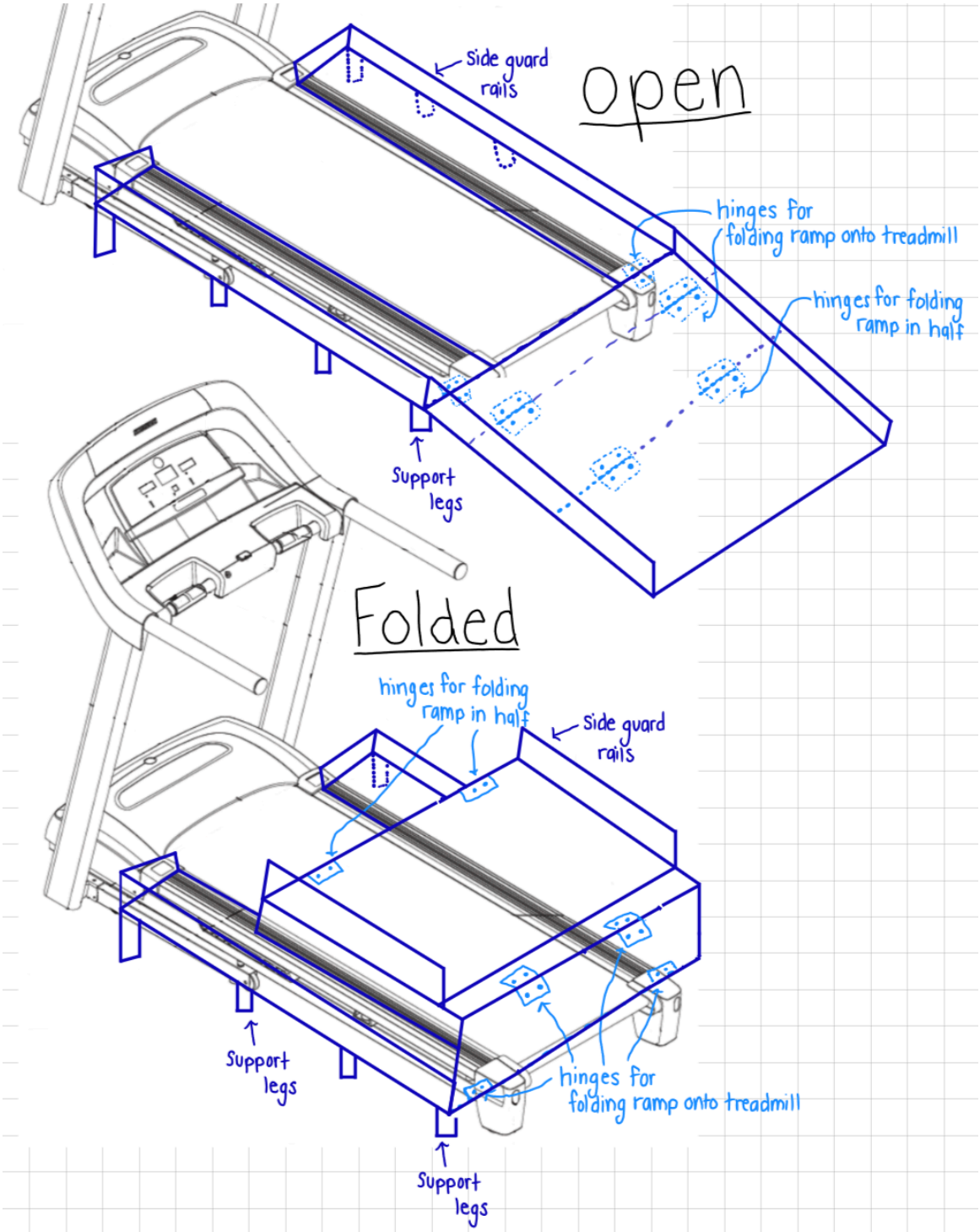
This design has tracks that are able to control the height and length of the ramp to be ADA compliant if the client would need to adjust to another treadmill with different dimensions in the future. The adjustment tracks are held in place by a screw clamp. There is a hinge at the bottom and the tracks are open to allow the ramp to fold fully flat. The gait trainer tracks are also removable and have telescoping legs that allows the ramp height to be adjusted to other treadmills. The tracks are secured to the treadmill with toggle clamps.

Design 2: Suitcase Ramp Full Image



The suitcase ramp design has three separate, detachable, components that can all be removed from the treadmill and easily transported to a new location for storage when the treadmill is not in use. The tracks will each be made from a lightweight wood and have wheels that will lock the tracks in place while in use. There will also be handles on the end of the tracks to allow caregiving staff to easily wheel the tracks away like a suitcase. The ramp will be made from aluminum with supporting legs underneath that can fold for when the ramp is stored and not in use. The ramp will have hinges horizontally along the center of the ramp so that it can be folded in half to take up less space while not in use. There also will be handles for easy transport. Additionally, the side walls on the ramp will attach to the side walls of the tracks via a toggle latch for stability of the entire three part system.

Design 3: Folding Ramp Full Image



This design has tracks along each side of the treadmill that partially rest on the treadmill edge and partially hang over supported by 4 legs. These tracks will be made of wood and permanently attached to the treadmill. Each track has a guard rail on the outer edge and on the front. At the back of the track, there are hinges that connect the tracks to the ramp, allowing the ramp to fold onto the treadmill. There is another hinge

on the ramp that allows the ramp to fold back onto itself. The ramp also has a guard rail on each outer edge and will be made of aluminum to ensure it is lightweight for folding.

Design Matrix Discussion

Safety - All three designs have similar mechanisms for securing the tracks to the treadmill and include supports underneath. Although they vary by specific design, safety-wise they are similar and provide the same effect with necessary locking and attachments. Design 1 has a safety concern with a bump created by the telescoping ramp that could potentially catch the gait trainer or cause the client to lose their balance.

Ease of Set Up - Each design has tracks that would need to be adjusted on and off the treadmill for each use. The addition of the ramp for each design also requires the attachments to be engaged for each use.

Weight of Device - The additional tracks for Design 1 would add more weight and would need to be able to securely hold the ramp in the desired position which would also add weight to the device. Design 3 would also need to have enough weight to the tracks to keep them stabilized on the floor. Design 3 was ranked the highest because the locking mechanisms on the wheels of the tracks would allow the tracks to be made of lightweight materials since the securing mechanism is built into the track.

Compactability - Design 1 was ranked the highest because of the ability to fold fully flat and shorten the legs on the tracks. Design 2 and 3 were tied, but for different reasons. For Design 2, the wheels would still have their height as that is unchangeable, but the ramp would still be able to fold up. Design 3 would be attached to the treadmill and fold on top, not allowing the treadmill itself to fold up but still reduce space the device would take up when not in use.

Ease of Fabrication - Design 1 and 3 were ranked lower because they require more elements to be fabricated. In Design 1, the track mechanism and telescoping aspect to allow the ramp to increase in length and height would require specific processes and mechanisms to ensure the adjustments could be made smoothly. Design 3 would need to have specific measurements to allow the ramp to rest compactly on the treadmill and not interfere with the tracks that would be on the side of the treadmill. Design 3 does not have any specific measurements required for compactability and the wheels and locking mechanism for the wheels would likely be purchased.

Adjustability to Other Treadmills - Design 1 is ranked the highest because of the ability for the design to be longer and taller to comply with ADA guidelines if the transition to another treadmill is needed. Design 2 and 3 could be adjustable to other treadmills because they are based off of the client's gait trainer, however, the height of each ramp is unable to be adjusted for other treadmills.

Cost - Design 1 would be the most expensive because of the extra materials required to fabricate the ramp. Design 3 would also be more expensive than Design 2 because of the additional hardware needed to fold the ramp up.

Winning Design

The winning design is the suitcase ramp. This design scored highest in five of the six scoring criteria categories. The wheels on this design make the set up and take down easier as the device can be wheeled onto the treadmill. The handle also contributes to the ease of set up, making it easier to maneuver. The foldable legs underneath the ramp portion of the device provide added safety and stability to this design. Although the suitcase ramp design is the winner based on the design matrix, the proposed final design will likely combine elements from all three of the preliminary designs. Feedback from the family and caregivers will be gathered in order to inform the team on what the best elements of these designs are, so that they can be combined into a singular design.