GNG-2101

Design Project User and Product Manual

Adaptive Ride Co. Product Manual for Wheelchair Stroller Attachment

Submitted by:

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Table 1. Acronyms

Acronym	Definition
BOM	Bill of Materials
DFX	Design for X
lb	Pounds (Unit of measurement)
UPM	User and Product Manual

Table 2. Glossary

Term	Acronym	Definition
Metrics	N/A	Measurable features of the system's performance, cost, time for implementation and safety etc.
Benchmarking	N/A	Process of measuring a product, service, or process against a competitor, industry standard, or someone who's considered "best in class."
standard wheelchair or stroller	N/A *Note: This is not an official definition, but one made for the purpose of this document.*	A standard wheelchair has two vertical (or near vertical) bars for the footrest to attach to. A standard stroller has swivel stem wheels.

1 Introduction

This User and Product Manual (UPM) provides the information necessary for wheelchair users to effectively use the adaptive ride (wheelchair stroller attachment) and for prototype documentation.

Adaptive Ride CO has designed an adjustable, safe, and universal wheelchair to stroller attachment. This product was designed for individuals that are in a wheelchair but still want to

push a stroller. This document is a guide to our wheelchair to stroller attachment, so that individuals in a wheelchair can continue to take their child out in a stroller with independence.

When designing our product, we made sure that the user would be able to use our product 100% by themselves, that included attaching, detaching, storing, and replacing parts. To achieve this, we made it light weight (4lbs) and included easy to use clamps. These two things made sure that users of different levels of mobility would be able to use our product as intended. We also created a universal design by adding a telescoping middle and rotating clamps. These features made the Adaptive Ride adjustable to multiple different wheelchair and stroller combinations. The Adaptive Ride has also been extensively tested for you and your child's safety as that is our number one goal.

Throughout this document you will find more information about the Adaptive Ride. It will start with a general overview of the product, then it will explain how to use the product in steps. Following that you will find support and troubleshooting. Then product dimensions and parts will be listed. Finally, you will find testing and validation. We have then included our future considerations on how we will make our next product even better.

2 Overview

2.0.1 Why Our Problem Is Important

The reason our problem is so important is because it is crucial to build a bond with the child and parent early on. It is also key that we make the user feel more independent and eliminate any stigma around people in wheelchairs. As well as, removing stress and responsibility for the other parent or caretaker, lessening the load for them and enabling the other parent to freely take their child out for a walk or wherever they need to be.

2.0.2 Fundamental Needs for Our Client

What our client needs to utilize our product safely is a wheelchair, may that be manual or electric. They need an omimovment wheel stroller. It is helpful for the client to have full fine motor skills, but it is not necessary.

2.0.3 What Differentiates Our Product from Others

For our product, the market for other wheelchair stroller attachments is very slim, there are few designs competing with us. However, the few that are, are crazy expensive compared to our low-cost design. Our product also incorporates non fine motor skill clients who may not be able to use clamp systems in other designs. We have a low weight system allowing clients with less strength to lift and manipulate our product with ease.

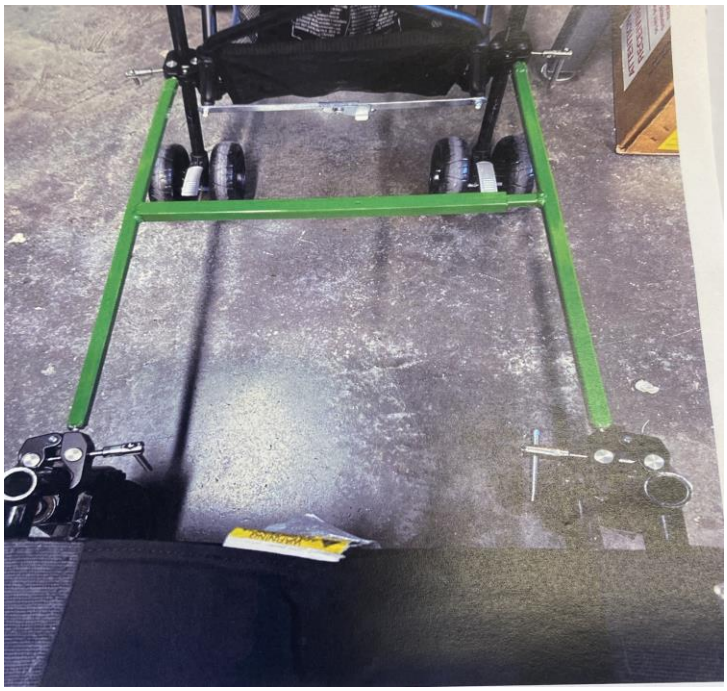

Figure 1: Final Desing 1

Figure 2: Final Design 2

The key features to our design are the pin mechanism allowing telescopic adjustment. Out V-clamps that are rubber lined to increase the friction and grip strength with lever like tightening systems allowing for ease of use. H-Bar frame made from steel. The construction of this product is multiple square tubes welded together to form one solid H frame. There are bolts welded to the H frame ends to connect the V-clamps to. The middle telescopic bar is a set of multiple holes aligning to different widths which is then held together by a pin mechanism.

2.1 Conventions

N/A

2.2 Cautions & Warnings

The user must have brakes on their wheelchair as there is no braking system on the attachment. Also, the user must have a stroller with all four wheels being Omi movement or else turning will be challenging on the user. The user must ensure that all four clamps are properly secured to their wheelchair and stroller with the rods being in the middle of the v on the v-clamps. It is not advised to use this device in extreme weather conditions or temperatures, ensure

that the environment you will be using is fit for the device. The user is recommended to replace the clamps every 5 years or until the rubber liner in worn (whichever comes first).

3 Getting started

1.) To begin with you remove the pin in the center of the H-frame and adjust the width to fit your wheelchair and stroller like so:

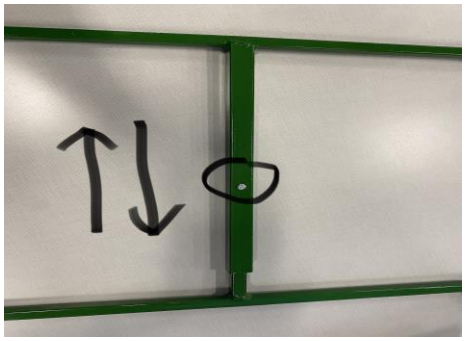

Figure 3: Pin and Sliding Mechanism

2.) Insert the pin once satisfied with the width.

3.) Orient the V-clamps for either the horizontal or vertical bar of the stroller.

4.) Attach and clamp down the clamps onto the stroller, make sure it is secure.

5.) Now secure the clamp onto your wheelchair like so:

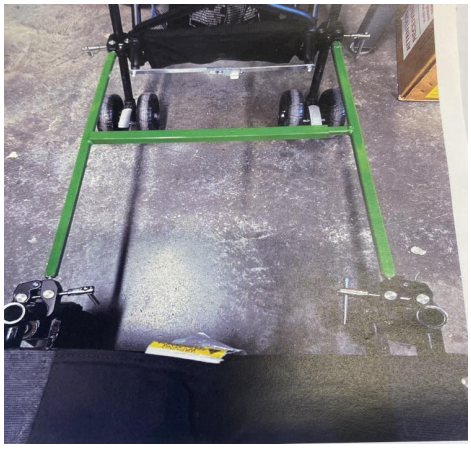

Figure 4: Connected

6.) Check to ensure that all clamps are secure and in place.

To exit the system:

1.) Untighten the clamps on your wheelchair.

2.) Pull the stroller towards you to access the stroller's clamps.

3.) Ensure the stroller is locked.

4.) Untighten the stroller's clamps.

5.) Remove the pin to have two separate pieces.

6.) Now store the device wherever is convenient.

3.1 Configuration Considerations

The product is an H-bar system made of welded steel. Each end of the two parallel steel rods has clamps on the ends that work together to either grip on to the wheelchair or stroller. The bar in the middle of the system is telescopic (can extend and retract) and has a pin that can be placed in different holes.

3.2 User Access Considerations

This product is geared towards individuals in wheelchairs that would like to attach a stroller to the front of their wheelchair. It is possible for users with low mobility to use our product as it is lightweight and has clamps designed for users to tighten and loosen with either their hand or wrist.

3.3 Accessing/setting up the System

The final product is very easy to set up. First the prototypes held by the center bar and loosen both clamps closest to the client. Once both clamps are loosened place the bars of the footrest inside the clamps and tighten. Once secured loosen the clamps furthest from the client and find a horizontal bar or two vertical bars on the stroller and tighten the clamps. After all the clamps have been tightened the attachment is fully set up.

3.4 System Organization & Navigation

Organization of the System

-The prototype consists of three main components: the left side of the frame, the right side, and the four clamps at each end.

Left and Right Sides of the Frame

-The left and right sides of the frame slide together, with a larger bar fitting into a smaller bar. A pin locks the two sides in place, securing the structure.

Clamps at Each End

-Four clamps are attached to the ends of the frame by screwing them onto bolts that protrude from the sides. These clamps provide additional stability and support.

Connections Between Components

-The left and right sides are connected via a sliding mechanism and locked with a pin.

-The clamps are fastened by screwing them onto bolts at the ends of the frame.

3.5 Exiting the System

To put away the product, remove the pin from the middle bar, separate the two bars, and store.

4 Using the System

The main body consists of a H-frame made of square steel that has four vise clamps screwed on to each corner of the H. The following sub-sections provide detailed, step-by-step instructions on how to use the various functions or features of the Adaptive Ride.

4.1 Telescoping mid-section

The mid-section of the H is telescopic to allow a range of wheelchair and stroller sizes. To use it, simply remove the retaining pin holding the assembly together and adjust to the appropriate size. Once done, return the retaining pin to the hole to secure the frame.

1. remove pin from hole

2. adjust to width of wheelchair/stroller

3. reattach pin by placing back into hole

4.2 Clamps

The clamps in each corner operate by a speed vise handle which allows the user to pull on the handle to tighten and loosen the grip. The handles themselves are long which provides a lot of leverage to get the proper force to bite down the vise. Their operation is to bolt down one clamp to the wheelchair and one to the stroller. Then attach the other side to the stroller and wheelchair.

1. Clamp one side to stroller and wheelchair
2. Adjust size of device (above)
3. Clamp other side to stroller and wheelchair

5 Troubleshooting & Support

1. **Alignment**
   1.1. If the clamps are not aligning with wheelchair and stroller rotate them until they are at the right angle to attach.
2. **Width**
   2.1. If the width of attachment does not align with desired width, pull out telescoping pin and adjust to desired width. Then place the pin back in to make sure it's secure.

5.1 Error Messages or Behaviors

N/A

5.2 Special Considerations

N/A

5.3 Maintenance

Since this product is made for the outdoors as well as indoors, rusting and degrading of parts will be present due to outdoor conditions such as salt, dirt, etc. Parts should be regularly checked for any corrosion or structural weakness. If the clamps wear out, they can be purchased on amazon.

5.4 Support

If support is needed with the H-frame, we recommend calling Alexandre Vandette as he can assist in any repairs or defects needed. Email pictures of the problem and write a descriptive email. Then arrange a meeting and explain thoroughly the issue with the H-frame. However, if any support is needed for the v-clamps we recommend following the link below and calling amazon support. They will be able to assist you with any defects or problems with the clamps. Contact amazon support and then email them pictures of the defects or issues with the clamps. Then proceed to either arrange a meeting or apply for a new set of clamps.

Alexandre Vendette
Space Manager

brunsfield@uOttawa.ca

613-562-5800 ext. 7076
STM 129
150 Louis Pasteur
Ottawa ON Canada
K1N 6N5

Hours of operation:

Monday 12-8
Wednesday 12-8
Friday 12-8
Saturday 10-6
Closed Tuesday, Thursday, and Sunday

Amazon support
https://www.amazon.ca/dp/B075M3Y21G?ref=ppx_yo2ov_dt_b_fed_asin_title

6 Product Documentation

6.1 H-Frame

The final prototype was an improvement of Prototype 3 built based off of a few problems. To accommodate for different widths on the wheelchair and stroller, we added a telescoping mid-section and to help with turning radius and the distance from the user to their child, we reduced the length of the parallel bars for the H-Frame. In terms of material considered; while aluminum was lighter, we ended up choosing steel for the product as it was necessary for its structural integrity.

6.1.1 BOM (Bill of Materials)

Item #	Description	Material	Quantity	Cost ($)	Store
1	Metal Rods	Steel	2	41.70	Home Depot bolts 3/8 | Search Results from The Home Depot Canada
2	Clamps	Aluminum	4	49.50	Amazon SmallRig 2 Pack Super Clamp w/1/4 and 3/8" Threads, Camera Clamps Clip Mount Crab Clamp for DSLR Cameras, Lights, Umbrellas, Hooks, Shelves, Rods, Cross Bars, Photo Accessories - 2058 : Amazon.ca: Electronics
5	Nuts	Steel	5	2.00	Home Depot
6	Bolts (3/8)	Steel	5	2.00	Home Depot
7	Metal Rod	Steel	1	3.00	Brunsfield

Table 4: BOM

6.1.2 Equipment list

-Welder

-Drill

-Hammer

-Screwdriver

-Grinder

-Sander

-Spray Paint

6.1.3 Instructions

The first step would to be to buy four clamps off amazon (https://www.amazon.ca/dp/B075M3Y21G?ref=ppx_yo2ov_dt_b_fed_asin_title)

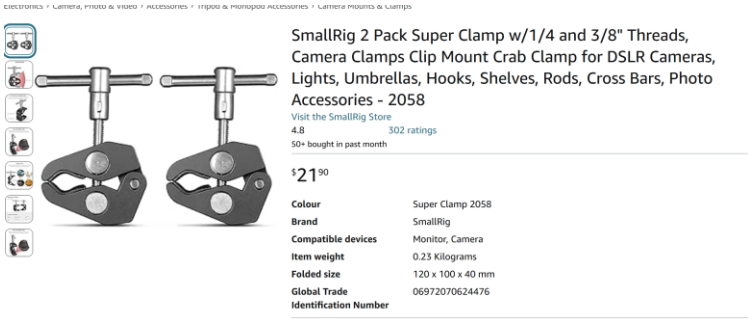

Figure 5: V-Clamps

The second step is to acquire two half inch square steel tube from Home Depot:

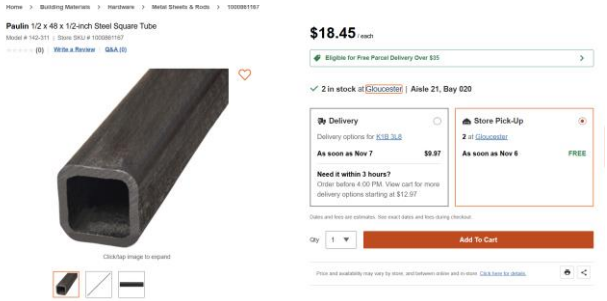

Figure 6: Square Steel Tube

The third step is to acquire five nuts and bolts (3/8”) and a pin of small diameter from any hardware store available.

The fourth step is to acquire the same type of steel as mentioned above but ¾ of an inch for the telescopic middle bar.

The fifth step is to cut and weld the ½ inch tubes and the ¾ inch tubes to create two T’s which connect to form the H frame with a telescopic middle bar like so:

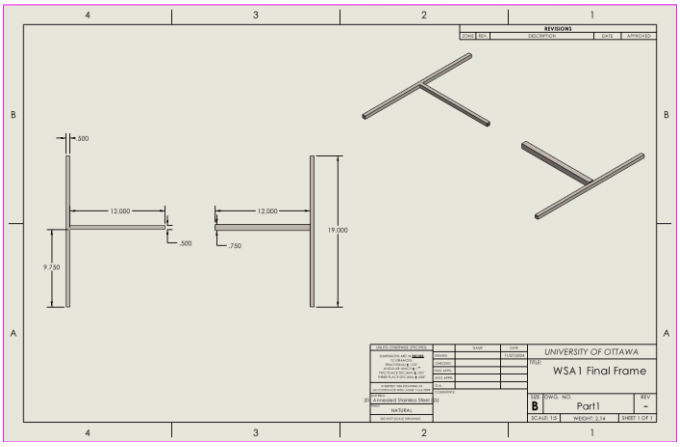

Figure 7: Drawing

The sixth step is to add rust-oleum spray paint to aid in rust/corrosion, the user can choose any color they like:

Figure 8: Spray Paint

The seventh step is to weld the screws to the ends of the H frame and screw on the nuts and clamps to ensure a tight fit.

The eighth step is to set the system to the desired width and mark the spot on both middle bars, then drill a hole to the diameter of the pin purchased.

Finally, insert the pin and ensure every part is securely in place, now your system is ready to go, it should resemble this:

Figure 9: Final Setup

6.2 Testing & Validation

Weight Test

Target Weight	Actual Weight
Under 20lbs	7lbs

Table 5: Target vs. Actual Weight

We designated a target weight of 20 pounds because this was the limit our client had set for us. However, we ideally wanted the prototype to come in at 15 pounds. We then performed the weight test by placing the prototype on a scale and measuring its weight. The test results came in at 7 pounds which is over half of our ideal weight. This was an acceptable result as our client said that lighter is better. Hence, we concluded testing for weight on the prototype and went ahead with the same design for the final product.

The test	Expected results	Actual Results
Torsion strength	Will not crack	Did not crack
Crossbar strength	Some damage will appear	Small cracks formed
Compression strength	Should not be crushed	Did not get crushed

Table 6: Testing

We needed to ensure that the device could handle different types and amounts of stress and force. Therefore, we brainstormed and produced the above three tests for the frame that we felt would be sufficient to properly test the limits of our design. We then proceeded to perform these tests on the frame to see what our results would be. The results were recorded, and they proved to be acceptable for each test. We took the prototype and performed the various tests listed above.

7 Conclusions and Recommendations for Future Work

Some lessons we learned throughout this project are communication between group members, client feedback is helpful, and time management is vital. We found that the more we communicated with each other the quality of work produced greatly increased. We also learned that the client feedback we received helps in designing a product the client will love. And lastly, time management skills were needed to complete a well-made product that was fully completed by the deadline. Some work we completed to get our final prototype were creating sketches and CAD designs, 3D printing a low fidelity prototype, and welding our final product together. Creating CAD designs was a very productive way of testing and seeing prototypes, it had no cost and could be completed in little time. We would recommend future groups to create CAD designs when possible if they are trying to be productive and efficient. If we had a few more months to work on this project we would get higher quality steel, get professional welding, create a pin cover, make it even more adjustable by adding a gimbal mechanism, rubber line the levers on the clamps, and test with electric wheelchair.

8 Bibliography

Small Rig 2 Pack Super Clamp w/1/4 and 3/8" Threads, Camera Clamps Clip Mount Crab Clamp for DSLR Cameras, Lights, Umbrellas, Hooks, Shelves, Rods, Cross Bars, Photo Accessories - 2058: Amazon.ca: Electronics

https://www.amazon.ca/dp/B075M3Y21G?ref=ppx_yo2ov_dt_b_fed_asin_title

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https://www.homedepot.com/b/Hardware-Fasteners-Bolts/3-8-in/N-5yc1vZc26wZ1z0sfy6

APPENDICES

9 APPENDIX I: Design Files

Most of the images and information in this document come from the Maker Repo, accessible via the link below. It also contains additional details about our process and prototypes leading to the final design. This document shares similarities with others provided, including pictures, testing data, and a deeper look into our design process.

GNG-2101-Adaptive Ride Co. | MakerRepo

Table 3. Referenced Documents

Document Name	Document Location and/or URL	Issuance Date

Adaptive Ride Co.	GNG-2101-Adaptive Ride Co. | MakerRepo	Nov 13th, 2024

10 APPENDIX II: Other Appendices