GNG2101

Design Project User and Product Manual

Posterior Walker Tray Table Manual

Submitted by:

TRAYS 4 WALKERS 4 YOU

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List of Acronyms and Glossary

Table 1. Acronyms

Acronym	Definition
BOM	Bill of Materials
PVC	Polyvinyl Chloride
UPM	User and Product Manual

Table 2. Glossary

Term	Acronym	Definition
Bill of Materials	BOM	A list of items used to manufacture a product and the instructions on how to do so
Polyvinyl Chloride	PVC	A high strength thermoplastic material used to build pipes (PVC pipes)
User and Product Manual	UPM	A document intended to assist users in a particular product, service, or application.

1 Introduction

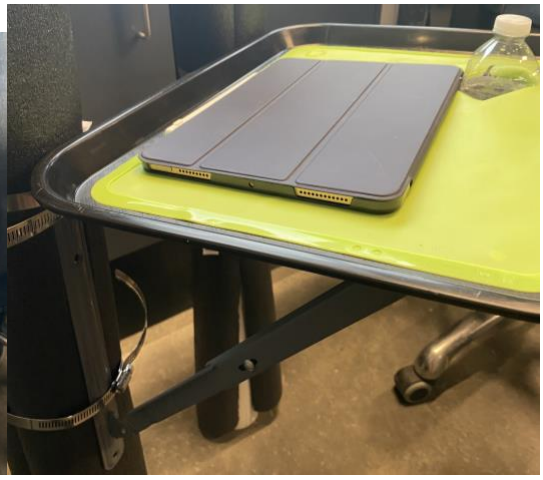
We recognize that there is a societal need to accommodate people who have been afflicted with disabilities that are physically or mentally impeding . In order to help individuals who use a posterior walker tray, we are presenting a posterior walker tray, a purposeful solution designed for a teenage girl seeking who is seeking greater independence in her house. The innovative tray that we designed serves as a practical aid and allows her to freely move kitchen utensils, and around the house.

We assume that we can build a functional tray specifically designed for a posterior walker that will satisfy the needs of our client. Such a tray would be designed using the Makerspace and the materials available in this design shop at a fixed, one-time cost. The tray product would undergo testing, and once completed, our client would receive one unit of this product design. Given that one unit of this design is to be made by hand, the environmental impact is little, while the social impact would be substantial.

In this user manual, we provide a comprehensive guidance on the design, assembly, usage, and maintenance of the posterior walker tray. More specifically, this document starts off with talking about the overview of the product. Then, it elaborates on how to use the entire system, and some special considerations to keep in mind when using the product. Finally, we present some product documentation, such as the BOM and a list of equipment, discuss our testing and validation process, and conclude with some recommendations for future work.

2 Overview

Our client requested a tray for her daughter who uses a posterior walker so that she could gain more independence. The user would like to help around the house with tasks, specifically being able to carry her kitchen utensils such as her plates and cups on her own. This tray would allow her to do these tasks around the kitchen, and more, and give her the independence she desires. Currently there aren't any posterior walkers trays out on the market for our client, which is why this project is so important to them. While conducting research, we had noted that existing trays for walkers were made for front walkers and as such, does not possess the stability or security needed for a posterior walker tray. Some of the key features of our tray are raised edges to create a barrier to stop objects from falling over the edges of the tray, a waterproof removable non-slip mat that keeps objects from sliding all over the tray and makes it easy to keep the tray clean, and a cup holder that fits different cup sizes. Regarding the trays supports, we have brackets which allow our tray to be foldable and plumbing clamps that help our tray attach onto the walker. These allow our tray to be stable and its non-permanent attachment allow the tray to be removed if needed. Additionally, we have foam to ensure that the legs of the walkers don't get damaged by the clamps. With our tray being designed specifically for posterior walkers, its easy cleaning thanks to our removable nonslip mat, easy installation and removal and its ability to keep items from falling off the tray, our tray is a better option for our clients than existing trays for walkers.



Conventions

If applicable, describe any stylistic and command syntax conventions used within this document. For example, when an action is required on the part of the reader, it is indicated by a line beginning with the word ‘Action’.

Cautions & Warnings

Caution: Do not exceed 25 lbs (11.34 kg) on the tray. Overloading the tray may compromise stability and safety, leading to potential hazards. Please follow this weight capacity limit to ensure the proper functioning and safety of the equipment.

3 Getting started

The first step is to clamp the tray brackets to the walker legs with the foam in between. Once the tray system is attached to the walker, the tray can be folded up and locked in its horizontal orientation to carry kitchenware.

Before placing kitchenware on the tray, the non-slip placemat should be placed on the surface.

Once the user has finished using the tray, the non-slip placemat can be removed, and the tray can be folded back to its vertical orientation.

The tray can remain on the walker, but if the user prefers to take the tray off, the clamps must be opened to disjoin the walker from the tray brackets and foam.

Configuration Considerations

The system is configured with the intention that the tray would be permanently linked to the brackets, while the attachment mechanism of the tray system to the walker is reversible. The brackets are linked to the tray using screws and nuts. The brackets support the tray similar to a shelf,

where in the non-folded state, the tray maintains a horizontal orientation and can support a range of weight. This system also includes a removable non-slip placemat, which can be washed when it gets dirty. The user does not need any tools for what has been mentioned so far for the system. As for attaching the tray-bracket system to the walker, there are the plumber clamps and the accompanying foam. With the plumber clamps open, the user surrounds the walker leg, foam, and tray bracket base with the plumber clamp and makes a closed circle with it. The user needs a screwdriver to tighten and secure the plumber clamps, such that the tray holds onto the walker and can remain without the user's physical support.

User Access Considerations

This tray was designed for posterior walker users. However, it is only built for one walker size. If there are posterior walker users who find that the spacing between the tray brackets is too narrow or too wide, then a medium could be integrated to connect between the foam and the base of a tray bracket on each side of the walker tray.

Accessing/setting up the System

The configuration is broken down into two main parts; the first being the attachment of the tray to the walker. To attach the walker to the tray, the legs of the tray need to be surrounded by the accompanying foam then the base of the tray brackets placed on top of the foam. While holding everything together, each clamp needs to surround a walker leg, foam, and tray bracket base before the clamp can be closed. Once the clamps are closed and secured tightly, the tray can be used. The second part of the configuration is regarding the use of the table. To reorient the tray horizontally, the user first lifts up the tray from the long edge closest to the cup holder. While keeping the tray lifted, the user then pushes down on the brackets to ensure the brackets are straight. Then to lock the brackets, the user pushes down on the tray.

System Organization & Navigation

Tray system

The tray system is composed of a few components. There is the tray itself, which is a standard cafeteria-style tray, which is attached to two foldable metal brackets by screw and nut connection. A cup holder was integrated into the tray. An accessory for the tray is the placemat, which is non-slip and removable.

Walker-connection system

The last two components on this entire apparatus are the foam and plumber clamps. The foam contacts the legs of the walker directly and the clamps hold together the brackets and walker legs with the foam in between.

Exiting the System

When the user is done with the tray, the user lifts the tray slightly and bends the brackets to loosen them, then the tray can return to its vertical position. If the user would prefer to completely remove the tray from the walker, they would need a flathead screwdriver to increase the circumference of the clamp until the clamp opens completely. Once the clamp is opened, the tray brackets and foam are disjoined from the walker legs and the tray can be stored elsewhere.

4 Using the System

The following sub-sections provide detailed, step-by-step instructions on how to use the various functions or features of the Walker Tray.

4.1 Clamps

The clamps serve to connect the folding arms to the legs of the walker. To achieve this, they tighten around the folding arms and the walker legs.

Firstly, position the foam around the legs along with the folding bracket in appropriate positions for installation. Unfurl the clamps around the foam and the bracket and then bring the free end of the clamp back into the driver end. Using a flathead screwdriver tighten the clamps until the folding bracket is in a loose fit around the foam. Repeat with all four clamps until everything is in the appropriate position. Finish tightening the clamps, so the folding bracket is sufficiently affixed and no longer able to be shaken or fall. Figure 4.1 displays the folding bracket sufficiently tightened to the legs.

Figure 4.1

4.1.1 Foam

Foam is used as a medium between the clamps and the walker legs to keep the metals from rubbing against one another. It also helps to reduce friction caused by the clamps

4.2 Folding Bracket

The folding bracket connects the tray to the walker and allows the tray to fold in a down or upright position. To achieve this the bracket makes use of two linkages on each side, in the down position the linkages slide into each other and form an upwards triangle between the tray and walker legs. The linkages extend until the tray is slightly above a 90-degree angle with the walker at which point they fall into each other through a small groove. When in the upright position the tray can be folded again by lifting it from the 90-degree angle and then pushing the linkages out of their locked position in order to fold the tray down.

Figure 4.1 displays the tray and folding bracket in the upright position while Figure 4.2 displays the tray and folding bracket in the folded position.

Figure 4.2

4.2.1 Tray

The tray holds the dishes and whatever else the user wishes to put on top of it. It has a mesh cup holder built in made of mesh that is able to fold with the tray without interfering with the walker. The tray is bolted to the linkages by 4 bolts and nuts. The Cup holder is bolted to the tray by 3 bolts. A silicone placemat comes off and on the tray that adds some stability for anything put onto the tray while being washable,

5 Troubleshooting & Support

Error Messages or Behaviors

Since the walker tray is solely based on mechanical parts and no software is involved, there are no error messages to include. Behaviors that we've seen occur are the brackets locking up and hardware eventually loosening up after an extended amount of usage.

Special Considerations

- To troubleshoot the mechanical lock-up, it is important to ensure that the tray is lifted in a way where both brackets come up at the same time. This can be ensured by lifting the tray

with a grip on both sides of the tray rather than just grabbing it by the middle. It is believed once attached to a walker that stabilization will improve on its own.

Maintenance

To avoid failure, the following maintenance can be done on a monthly basis to ensure the quality of the product.

- Lubrication of the joints
- Tightening the hardware
- Proper cleaning of the device

Support

Our teams support service can be reached at the following emails:

The following steps must be ensured to be followed for us to service your inquiries in a timely manner.

1. The subject line must include the major issue.
2. If there is a security problem, please add ''SECURITY" in the subject line
3. The email should include the problem with the system in detail.

- All questions regarding the usage and or installation of the product can be sent by email to Tristan Rochon at troch.052@uottawa.ca
- All questions regarding the product quality or warranty can be sent to Upama Utpal at uutpa088@uottawa.ca

6 Product Documentation

<Subsystem 1 of prototype>

6.1.1 BOM (Bill of Materials)

Item Name	Description	Unit Measure	Quantity	Unit Cost	Extended Cost
Plumbing Clamps	Sae #24 1 inch To 2 inch Steel Clamp	Units	6	$2.07	$14.28
Nuts and Bolts	Holds and secures parts together	Units	8	$5.88	$6.64
Shelf Brackets	Acts as a Linkage Mechanism	Units	2	$9.99	$11.29
Foam	Protect Walker from Friction to Clamps	Units	2	$5.78	$11.56
Plastic Food Tray	Cafeteria Tray with Patterned Surface for Restaurants, Commercial Kitchens, 17.87 X 14 X 0.98 Inches, Black	Units	1	$6.72	$7.59
Cup and Bottle Holder with Mesh Net	Device to Hold a Drinking Vessel on the Tray	Units	1	$15.99	$29.36
Silicone Placements	Washable Placemat to Cover the Tray Top	Units	2	$11.95	$13.50

Total: $94.22

6.1.2 Equipment list

To build this subsystem, a list of different materials we're needed. We can neglect software because other than research.

- Torx Screwdriver

- Flat Head screwdriver
- Drill press
- Wrench
- Precision knife
- Dremel
- Sandpaper

6.1.3 Instructions

1. Fixing the tray to our mechanical device

    - To fix the tray to our mechanical device (lock brackets) we simply used a small wrench and screwdriver (M4) to tighten and fix our two subsystems together. Beforehand it was best to predrill holes according to the size of the screws, otherwise it would have been a fight to get the screws through the plastic material.

2. Fixing our first subsystem to the (walker)

    - To attach our tray and mechanics to the frame we used a flathead screwdriver to tighten the plumbing clamps to our mock walker which we're the PVC pipes. Around these pipes we had plumbing insulation foam that was implemented to save the walker from scratches and knicking.

3. Fine work

    - Now that our system was complete we could work on fine details such as creating our hole for our cup holder. To do so we first outlined a 3" hole with a marker and went

around it with a precision knife to mark our cut. Afterward we used the dremmel to peirce the plactic and create our hole. Once our hole was created we sanded down our cut with sandpaper to ensure a better fit for our cup holder. Once done we sat the cup holder into our desired hole and fixed it by pre drilling on the drill press and assembling again with nuts and bolts. Our final addition to the design was to neatly place our rubber surface onto the tray to ensure stability. Once done we used the precision knife to cut out slits to allow our cup to still be able to slide into our holder.

Testing & Validation

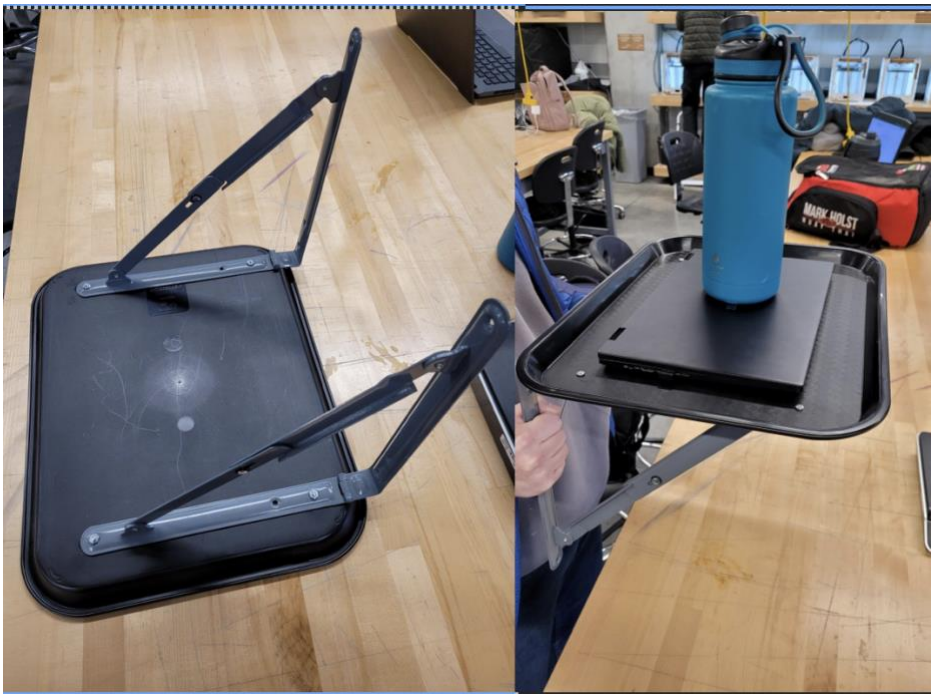
For the most part our tests included measurements of the tray in length, width and height as well as tests on the product weight and its maximum wight capacity. The values we obtained in the testing of our final prototype are in the following table.

Metric #	Metric	Ideal Value	Our Value
1	Length	40 +- 15 cm	45 cm
2	Width	35 cm	35.5 cm
3	Height	4 cm	2.5 cm
4	Weight	>3 lb	~ 2 lb
5	Weight Capacity	10 lb	~ 25 lb
6	Foldability	Yes	Yes
7	Colour / Aesthetics	Pleasing / Purple	N/A

Tests on prototype 1;

Testing on camping tables mechanisms to ensure the quality of our idea and if it fit the needs we were looking for

Tests on prototype 2;
Similar tests we're conducted a second time with our version of the camping chair style side table.



7 Conclusions and Recommendations for Future Work

Lessons Learned

Some lessons we had learned is that budget planning and allocation is much harder than it seems, as surprise costs such as shipping could increase the cost of certain items substantially. Another lesson is that materials and resource preparations are crucial for ensuring proper time management as it minimizes disruptions and allows us to maintain project momentum. Lastly, we learned that having a way to quickly communicate with the client greatly increases the usability of a product as you can ask them specific questions such as asking for dimensions that may be needed to create the product, asking for pictures needed to create a concept, etc.

Future Work

If we had further time to work, there are a few key changes and improvements we would make to the design.

Clamps

The clamps used are plumber clamps that require a flathead screwdriver to use. This sort of clamp is unwieldly and time consuming to set up, especially should the user have difficulties with fine motor control. As an improvement the plumber clamps could be changed to male push-in clamps directly affixed to the brackets, these would make installation significantly easier at little cost to tray stability. Otherwise, the plumber clamps could be changed to be hand screwed rather than needed a flathead screwdriver by affixing

a tab to the drive screw, this would make installation easier while keeping stability but is still quite cumbersome and slow.

Bracket-Walker Medium

The rear legs of the walker are inclined inwards which necessitates a medium between the bracket and walker for the tray to be un-foldable at a 90-degree angle. This issue was discovered after the final prototype was nearing completion and difficult to address given the groups lack of access to the walker. With more time, and access to the walker, a medium could be affixed to the brackets and clamped to the legs as part of the folding system.

Conclusion

The project was completed slightly behind schedule with certain aspects capabale of significant improvement. However, the final design was capable of providing a posterior walker tray that held up to client needs and satisfied the group.

8 Bibliography

BOM Items

Tray:

https://www.amazon.ca/Carlisle-CT141803-Standard-Cafeteria-Polypropylene/dp/B06Y226G55/ref=sr_1_3?crid=2JY4CN5KS3GGV&keywords=plastic+food+tray&qid=1696343369&s=kitchen&sprefix=plastic+food+tray%2Ckitchen%2C96&sr=1-3

Foam:

https://www.homedepot.ca/product/tundra-foam-pipe-insulation-self-seal-1-3-8-inch-id-x-1-2-inch-wall-x-6-ft-1-piece/1001391029

Nuts and bolts:

https://www.homedepot.ca/product/paulin-1-4-20-x-1-1-2-inch-flat-head-square-drive-stove-bolts-with-nuts-plated-steel-9-pcs-/1000120355

Clamps:

https://www.homedepot.ca/product/waterline-sae-96-5-9-16-inch-to-6-1-2-inch-steel-clamp/1000123503

Brackets:

https://www.princessauto.com/en/2-pk-12-x-12-in-foldable-shelf-brackets/product/PA0009121062

Placemats:

https://www.amazon.ca/dp/B07L4DHXTT?ref=ppx_pop_dt_b_product_details&th=1

Cup holder:

https://www.confluenceoutdoor.com/en-us/products/cup-and-bottle-holder-with-mesh-net/PS1301

Trays for Comparison

DMI walker tray:

https://www.amazon.ca/DMI-Folding-Walker-Tray-Holders/dp/B000CSOQJQ/ref=sr_1_5?crid=2YS6WG5D1DL1O&keywords=dmi%2Bwalker%2Btray&qid=1702241071&sprefix=dmi%2Bwalker%2Btray%2Caps%2C90&sr=8-5&ufe=app_do%3Aamzn1.fos.b06bdbbe-20fd-4ebc-88cf-fa04f1ca0da8&th=1

Drive medical walker tray:

https://www.amazon.ca/Drive-Medical-10125-Folding-Walker/dp/B002VWJYQQ/ref=sr_1_1?crid=2ILJMFPQP0ARY&keywords=drive+medical+walker+tray&qid=1702241259&sprefix=drive+medical+walker+tray%2Caps%2C100&sr=8-1&ufe=app_do%3Aamzn1.fos.b06bdbbe-20fd-4ebc-88cf-fa04f1ca0da8

Nova medical products tray:

https://www.amazon.ca/NOVA-Medical-Products-Folding-Walker/dp/B004G7RCC2

APPENDICES

9 APPENDIX I: Design Files

https://makerepo.com/tristanrochon/1905.trays-4-walkers-4-you

Table 3. Referenced Documents

Document Name	Document Location and/or URL	Issuance Date

10 APPENDIX II: Other Appendices