GNG 2101

Design Project User and Product Manual

The Dressing Tree

Submitted by:

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December 10th 2023

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1.1 User manual

This User and Product Manual (UPM) provides the information necessary for individuals with arthrogryposis multiplex congenita (AMC) to effectively use the 6-1-Tree Dressing Tree and for prototype documentation. This product effectively allows users with different abilities to get dressed independently and efficiently.

By using a system of hooks, the user will be able to drape their desired article of clothing on the curved shape of the hooks. The user will then slide into the article of clothing with easy. This will allow for minimal use of joints and muscles.

It is assumed that the user with AMC will have assistance when assembling the dressing tree as well as moving the bars when needed as the horizontal and vertical beams as well as tightening the screws will be difficult to put together for those with AMC.

This document will provide the user with clear information regarding the dressing trees assembly, function, troubleshooting as well as any other considerations. It is highly recommended to read this document before assembling the dressing tree to consider the different aspects of its function. The safety of the user and client is a vital aspect taken into constant consideration, thus, the client and/or user should be familiar with all aspect of the document, if there are any uncertainty, please reach out to the support number or email, our team will be happy to assist you.

The product of this document is intended only for the 6-1-tree dressing tree client and user as it may contain confidential or proprietary information. Additionally, any information provided by the client or user is confidential and will not be shared with any institition unless granted permission.

2 Overview

A product is needed for a client looking for a product that will allow his seven-year-old daughter, the user, with arthrogryposis multiplex congenita (AMC) to get dressed independently. This is important as it provides people with different abilities a sense of independence as well as

makes time to get dressed quickly. This also allows caregivers and parents to focus their time and attention on other situations.

The needs of the user are that the product must be safe, adjustable, can be used independently as well as space adequate. To begin, the dressing tree should be stable enough to not tip to the sides or be able to be pulled down from the hooks. The dressing tree is structured in a manner that assures safety and support to the user. Additionally, the dressing tree is aimed to be a sustainable product; thus, it is built in a manner that allows the user to adjust the horizontal beams holding the hooks. This allows the user to maintain the dressing tree as they grow; and avoid repurchasing a dressing tree in a different size. Furthermore, the dressing tree caters to those with fine motor skills. The user should not require much strength to be able to get dressed using the product. However, the user would require assistance when assembling the dressing tree as well as shifting the horizontal bars to the desired height. Finally, the dressing tree is fairly compact, it does not take much floorspace or wall length. This allows the user to enjoy a variety of options in regarding to the placement of the dressing tree. Furthermore, the light weight allows the dressing tree to be easily moved from one place to another without trouble.

The 6-1-Tree dressing tree differs from others as it is customizable for each user. From the variety of hooks used, to the decided length of the horizontal beams, this dressing tree is designed to supply a comfortable experience for each user. Additionally, the materials used to construct the dressing tree are all off the shelf components, this highlights the simplicity of the design and uncomplicated idea. The dressing tree should not be an overwhelming experience, rather it is aimed to make the user feel confident and assertive. Furthermore, the 6-1-tree dressing tree has two distinct types of hooks; each set of hooks can be used for different articles of clothing. For instance, the hooks used for shirts differs than those used for socks.

The key features of the dressing tree are the two different horizontal bars holding different hooks. This will allow the user to be able to decide the placement of two different sets of hooks; aimed at helping the user get dressed in different garments. The placement of the two beams also saves time and energy of caregivers/parents as it is not simply one hook that must be moved frequently. As there are two beams, the flexibility of the two allows for more usage of the product.

The architecture of the structure consists of off the shelf materials. For the all the vertical beams; the horizontal and vertical, Aluminum Extrusion was used to create a stable structure that will provide the necessary support. Additionally, small metal plates and screws were used to secure the horizontal beams to the vertical ones. The hooks used have rubber at the end to assure the client experiences comfort when using the dressing tree.

2.1 Conventions

Since this dressing tree is very customizable to each user, it is important to be able to mark the preferred place of placement of the hooks. Therefore, there will be a poster provided to allow each user to mark their preferred placement.

2.2 Cautions & Warnings

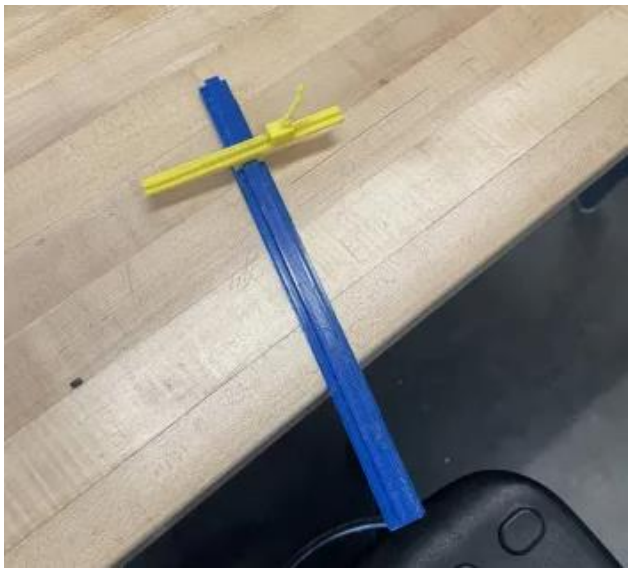
Although the dressing tree is not heavy, individuals with AMC might require assistance assembling. Do not attempt to construct without support.

Assure that the dressing tree is used only for its purpose and not other dangerous activities.

Assure only one individual is using the dressing tree at a time.

Assure the dressing tree is bolted securely into the wall.

Assure the screws are tight.



3 Getting started

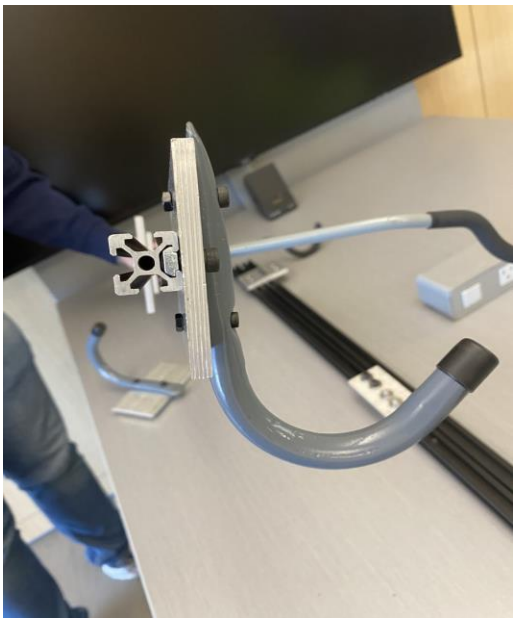
The assembly process of the dressing tree is fairly simple. All that are needed are a 4mm Allen key along with a drill for quick assembly.

To begin, remove the components from the respective package and lay them out.

Next, begin with bolting the dressing tree to the wall using the long 8 mm screws; it is recommended to use a drill.

Then, figure out the desired length the horizontal beams will be at. Assure the client is comfortable with the height. Insert the horizontal beams through the vertical ones using the t-nuts and the Aluminum extrusion ‘path’, tighten them using the 4mm Allan key.

Finally, insert the hooks on to the horizontal beams the same manner in the step before, assure the user is comfortable with the space between each hook.



3.1 Configuration Considerations

The configuration of the dressing tree is two vertical beams mounted to the wall, then there are two horizontal beams with hooks attached. The horizontal beams attached to the vertical beams can be moved up and down the length of the vertical ones. Additionally, the hooks can be moved left and right on the vertical beam to suit each user. To build the dressing tree, only a 4mm Allen key is needed; if desired a drill will be of much assistance.

3.2 User Access Considerations

Although this dressing tree is built for individuals with AMC; anyone who has fine motor skills and needs assistance whilst getting dressed can be of benefit from this dressing tree. Additionally, this dressing tree can be used in hospitals and facilities to allow individuals with different abilities the chance to experience independence whilst getting dressed.

3.3 Accessing/setting up the System

To set up the dressing tree; a 4mm Allen key is required to screw on the horizontal bars to the vertical ones. Additionally, a drill might aid in screwing in the screws. To begin, bolt the two vertical beams at the desired length to the wall, using the 4 wood pieces provided. Next, insert the bottom horizontal beam through the top of the vertical ones; assure they are aligned correctly. To insert the horizontal beams, use the Al extrusion to guide down the t-nuts down the vertical beams. Use the 4mm Allen key to lock the t-nuts into the desired place. Next, repeat the last two steps with the top vertical beam. One both the beams are secured; insert the hooks into the horizontal beams and tighten them in the desired place.

Since the dressing tree is designed to be customizable for each user, its features are designed for personal use. For instance, the hooks are made to be able to slide along the horizontal axis. This is because everyone has a different preference regarding where they want their hooks to be. Moreover, the horizonal beams are adjustable to suit the height of the users, to adjust the beams to the preferred height, simply use a 4mm Allan key and screw on it on at the correct height.

3.4 System Organization & Navigation

3.4.1 Main component/structure

The main component of the dressing tree is the structure, both the vertical and horizontal beams. The vertical beams are bolted to the wall whilst the horizontal beams are inserted into the vertical ones and are screwed in.

3.4.2 The attachments of the dressing tree are the hooks. They are attached to the vertical beams in a manner that always them to move to be at a desired length. However, due to safety reasons, both hooks are not able to be on the same size as that will cause unbalance in the structure.

3.5 Exiting the System

The dressing tree does not need to be put away after each use as it needs to be used constantly. However, if the client/user wants to make the dressing tree more compact; taking off the hooks using a 4mm Allen key would reduce the space it takes up. Additionally, the user can

take off the bottom of the aluminum extrusion with an Allen key to make the dressing tree shorter

4 Using the System

To be able to change the height of the horizontal beams, one must use a 4mm Allan key to unscrew screws on the vertical metal plate. Next, the individual will decide where the horizontal beams with the hook will be placed. Once decided the horizontal beams will be screwed in tightly on each different vertical beam.

To change the position of the hooks on the vertical beams, the user is able to unscrew the screws indicated using a 4mm Allan key. Then, the individual will move the hooks to the desired place, there they will use once again the 4mm Allan key to screw in the hooks in the correct position on the beam.

4.1 Hooks

The hooks used for this system are on the horizontal bars. The horizontal beams are connected to the beams on the vertical beams. The user will be able to use the hooks to be able to get dressed independently. The hooks are slightly curved up to allow for easy access to the articles of clothing. The hooks are curved to a degree that allows effortlessness when getting dressed. Additionally, the hooks are coated with a layer of rubber material. This allows the hooks to be gentle and warm for the user.

5 Troubleshooting & Support

The dressing tree might show signs of malfunction if the dressing tree is put together incorrectly. It is important that everything is secure to allow for maximum safety. Additionally, the hooks must be in the correct distance to allow the user to get dresses easily. If the users are having any trouble; it could be due to the hooks being at a distance to large or small for the user, thus some trial and error is needed. Additionally, the horizontal beams must be at the correct location as well; so, the user does not struggle.

However, if there is a suspicion in one the parts being incorrectly built, the 6-1-trees team is ready to assist both virtually and in person.

5.1 Error Messages or Behaviors

It is vital that the horizontal beams are secured correctly as it provides the correct amount of security when in use. If they are not secured safely, they will wobble and not allow the user to

get dressed independently. Additionally, the distance between the two hooks must be adequate, if not, the user will not be able to get dressed comfortably.

5.2 Special Considerations

Some users might desire more hooks other than the standard ones, or different types of hooks, made of different materials, or made at different sizes and lengths. Therefore, our website provides a variety of hooks to choose from. Additionally, the height of the dressing tree can always be alerted to suit different individuals.

5.3 Maintenance

This dressing tree is designed in a manner to be durable and sustainable for a lengthy period of time. It requires minimal maintenance once set up. However, the horizontal bars will need to be moved to the desired height of the user occasionally. Additionally, it is important to keep the bar in a clean state to assure the hooks and horizontal bars are able to move with ease.

5.4 Support

In the event of any emergency, please call 613-301-3737 for immediate assistance, and speak to our production support. If there is an injury, please call your local Police immediately.

If you would like to contact the system support group, please email pfour008@uottawa.ca for assistance related to assembly. sboud075@uottawa.ca for assistance related to the vertical and horizontal beams. gfitz024@uottawa.ca for assistance related to the hooks. oxu020@uottawa.ca for assistance related to safety and other concerns.

Please provide a clear description as well as any attempts to resolve the issue. Additionally, adding pictures if possible; will allow for a faster solution process. Our team will be happy to help with any issues or concerns.

6 Product Documentation

The final design was built by using Aluminum extrusion as the structure of the dressing tree. Both the vertical and horizontal beams are made from that material. The aluminum extrusion was cut into 5 feet for the vertical beams. Next, the horizontal beams were cut into 3 feet. Then, the bike holder hooked purchased was cut into two pieces through the middle. The hooks had to be welded onto metal plates to allow for security. Metal plates were also cut to be able to attach

the hooks to the Al extrusion. The hooks had to have been drilled into to allow the metal plates to be attached to them through the back. Then the metal plates had to be drilled into to make holes that will allow the hooks to be attached. After that, screws had to be cut into the correct length to be able to be attached into the hooks. Blocks of wood have been cut and attached to the back of the metal plates for easy installation onto the wall. Finally, all the parts were ensembled together; the horizontal beams were glided through the tea nutes into the vertical beams and tightly secured using the 4mm Allan key, this step was also used when the hooks were glided onto the vertical beams.

6.1 Structure

6.1.1 BOM (Bill of Materials)

Item Name	Description	Quantity	Unit Cost	Extended Cost
Aluminum Extrusions	T slots, 1000mm x 20mm x 20mm	2	18	36
Toggle Clamp Vertical	6 inch	2	10	20
Toggle Clamp Horizontal	5 ½ inch	2	5	10
T Nuts	From the TA, used to insert into aluminum extrusions	Around 20	14.04$	15.86$2
Steelworks Weldable Steel bar	For welding/repair/ fabrication. 4 x ¼ inch (thickness)	1	21	21
Steelworks Weldable Steel Flat	For welding/repair 3 feet x ½ inch x 1/8 inch (thickness)	1	7	7
Wood	2 x 4 x 2 feet	1	4	4
Bolts	To bolt into the wall			
Screws	To screw in clamps onto sliding piece			
Paint (Iced Lilac)	To paint the dressing tree	1	11.99	$13.55
Mastercraft Wall Mount Foldable Horizontal Bike Hook / Bike Hanger, Up to 23-kgs	Hooks used to be attached to the beam.	1	19.99	$22.59
Handy Hook	Hooks attached to the second beam.	2	6.99	$13.99
Metal Bars/plate	To attach to the aluminum extrusion	11	1	$11

Total cost	173.13

6.1.2 Equipment list

The equipment used is

A mill

A metal cutting bandsaw

A wood cutting bandsaw

A drill press

A Drill

A 4mm Allan key

6.1.3 Instructions

To start the build of this product, we must cut the aluminum plates at every couple inches. With these plates, we must then mill holes to insert the screws connected to the tee nuts into the plate. In this dressing tree, there are three different measurements of plates.

Firstly, the back connectors are used to connect another piece of the aluminum extrusion to the main one-meter pole. The measurement of this plate is 3inches on the horizontal and and 2 inches on the vertical. We will drill four holes at one inch on the vertical axis and at 0.325, 1.075, 1.925, and 2.575 inches on the horizontal axis.

Secondly, the second aluminum plate is designed to be able to place the dressing tree on a wall. These plates will be screwed to a wooden block that can then be screwed into the preferred wall. For these plates we must drill 4 holes to be able to place the screws inside. We will drill holes at the x axis of 0.55in and at 2.45in, while the y-axis will be at 0.667in and 1.333in. Note that four plates are needed in this part for secure stability with the wall.

The third set of plates are used to connect the vertical aluminum to the horizontal one. For these ones, set the y-axis at the center of the plate at 2in and mill holes at 0.37in, 0.74in, 2.26, and 2.63in. Another 4 holes are needed at an x-axis of 1.5in and at y-axis of 0.533in, 1.067in, 2.934in, and 3.467in. Note that two plates like these are needed for one horizontal bar to connect to the vertical beams. If more horizontal bars are required, more plates are also needed.

A final set of plates must be fabricated as well, but this part is based purely on the user's preference. These plates are the holders for the hooks, so naturally not all the plates are going to be identical. In this case, two sets of hooks were built, one bike holder hook and another tool holder hook. The bike holder hooks were welded onto the al plate and the tool hooks were connected to the plate by screws. There are multiple ways of inserting these hooks into the system.

To continue, 4 blocks of wood are required to connect the dressing tree to the wall. These blocks can be any dimension as preferred, but the block in this project had dimensions of 5in in length, 2in in height, and 4in in width. The next step is to mill holes inside the wood blocks at the screws placed on the second set of aluminum plates. Note that this is done easier by marking the screw places and then filling instead of finding adjusting the axis on the mill.

Next up, the aluminum plates must be inserted onto the aluminum extrusions. To do this, tee nuts with the right dimensions for the al extrusions and screws that fit inside the milled holes are both needed. Insert the screws into the al plate holes and screw just a little to be able to fit plates inside the al extrusion rails. When the plates are at the right position, tight the screws until the plates stop moving. The same thing must be done on the other extrusion bar. Now the horizontal bar can be inserted on these two vertical poles with the tee nuts as well.

The hooks are now able to be inserted onto the horizontal bars in the same way as the aluminum plates were inserted on the vertical poles. These hooks can then be tightened and untightened at any time to place them to the user's needs.

Lastly, the dressing tree must be mounted on the wall to be functional. To do this, find a good spot to place it. The dressing tree is 1.5 meter high and 1 meter wide, so a big amount of space is required. Place the blocks at the right location for the dressing tree and screw two screws on each wood block. Then add the dressing tree on top of the wood blocks by inserting the the back screw inside the wood block holes. Then screw small screws between the al plates to the wood.

The dressing tree is now ready for use. For aesthetic purposes, paint and sticker decorations can be easily added to dressing trees to make it more personal and enjoyable.

6.2 Testing & Validation

The tests done on the prototype for the final design are a weight test to be able to assure the dressing tree can withstand the weight of the user. This has been done through calculations and testing. The group had an individual with AMC attempt to use the dressing tree; as it was easy for the user to slide into the garments, it was clear the prototype was able to function correctly.

7 Conclusions

In conclusion, the 6-1-Tree Dressing Tree represents a groundbreaking solution for individuals with arthrogryposis multiplex congenita (AMC), offering them the independence and efficiency they deserve in the daily task of dressing. This User and Product Manual serves as a comprehensive guide, ensuring users and caregivers understand the assembly, functionality, and maintenance of the dressing tree.

The dressing tree's unique design, featuring customizable hooks and adjustable horizontal beams, sets it apart from conventional solutions. Its thoughtful construction, utilizing off-the-shelf components and a stable aluminum extrusion structure, emphasizes simplicity without compromising effectiveness. The inclusion of rubber-coated hooks prioritizes user comfort, showcasing the product's commitment to user-centric design.

The manual provides detailed instructions on assembly, user access considerations, and troubleshooting. Safety precautions and guidelines are underscored, emphasizing the importance of securing the dressing tree to the wall and ensuring proper assembly to prevent accidents.

Notably, the system's adaptability extends beyond AMC users, benefiting anyone with fine motor skill challenges. The commitment to sustainability, ease of use, and personalized configuration positions the 6-1-Tree Dressing Tree as a versatile and inclusive solution.

As the dressing tree becomes an integral part of users' daily routines, the support infrastructure is robust, helping through both virtual and in-person channels. The emphasis on user support, customization options, and durability aligns with the overarching goal of enhancing

users' independence and overall quality of life. The 6-1-Tree Dressing Tree is not merely a product; it is a testament to inclusive design thinking, empowering users to navigate life with increased autonomy and confidence.

APPENDICES

8 1 APPENDIX I: Design Files

9

Table 3. Referenced Documents

Document Name	Document Location and/or URL	Issuance Date
6-1-Trees Makerepo	https://makerepo.com/yamamalsaadi/1912.61trees	28/11/2023
Dressing tree project page	https://makerepo.com/project_proposals/372	16/08/2023
SolidWorks files	Final Prototype.zip	10/12/2023

Erreur! Utilisez l'onglet Accueil pour appliquer Heading 1 au texte que vous souhaitez faire apparaître ici.