

Toddler Mobility Trainer Modifications

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ABSTRACT

The Toddler Mobility Trainer (TMT) is a 3D printable device designed to help young children develop mobility and independence. Compared to traditional pediatric wheelchairs, which can cost over \$250, the TMT is a more affordable alternative, costing approximately \$40 in materials.

In this project, the original TMT design was modified to improve safety, usability, comfort, and user engagement. Key improvements included the addition of a braking system, adjustable tray, ergonomic handle, wheel modifications, and enrichment features.

These modifications demonstrate how low cost, open source mobility devices can be adapted to better meet the needs of young users and their caregivers while improving overall functionality.

INTRODUCTION

The Toddler Mobility Trainer (TMT) was developed as a low-cost, 3D printable mobility device to support early independence in young children. Traditional pediatric wheelchairs can be expensive and less accessible, creating a need for more affordable alternatives.

Research on mobility devices and user feedback highlights the importance of safety, comfort, and usability in improving the daily experience of wheelchair users. Many existing designs lack features that support independence and engagement, especially for young children.

This project focuses on modifying the original TMT design to address these limitations by improving safety features, usability, and interactive elements while maintaining affordability and accessibility.

PROJECT GOALS / OBJECTIVES

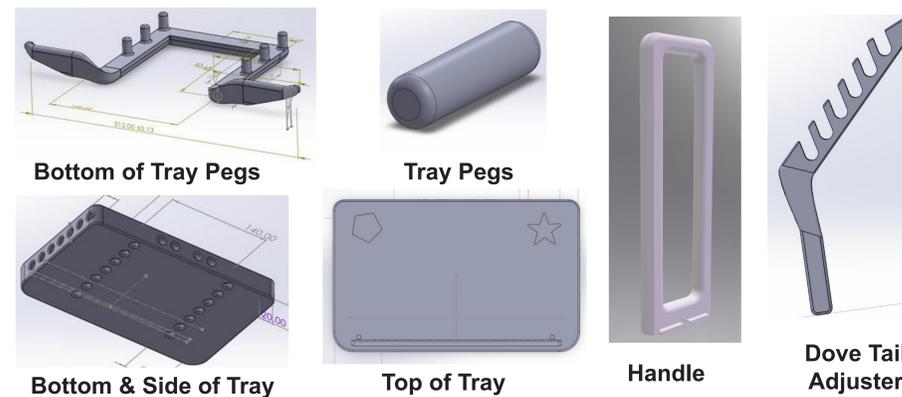
- Must be printable using 100% PLA on Prusa MK4IS at 1/4th scale.
- Must not compromise any of the original Make Good safety features.
- Modifications should improve functionality, ergonomics, or usability.

RESULTS – APPLIED MODIFICATIONS

Safety Improvements:

A wheel cover and handrail were added to reduce contact with germs and improve grip for small hands. The guard also helps prevent clothing or hair from getting caught in the wheel.

A peg-based brake system using holes in both the wheel and halfway into the frame of the chair. A peg can be inserted through both components to lock the wheel in place and prevent movement.



Ergonomic Improvements:

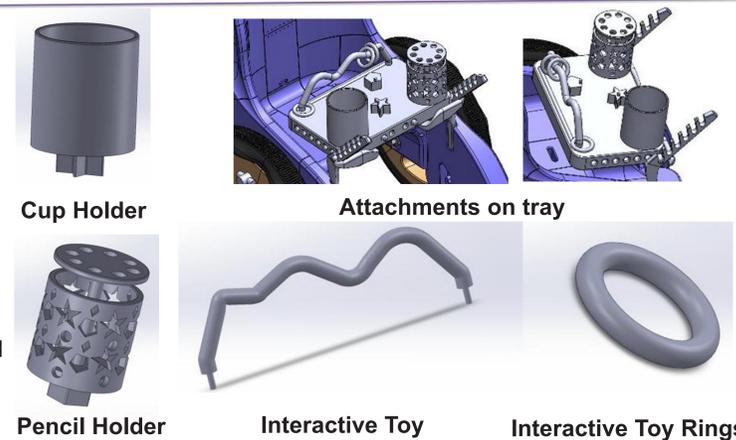
Taller handle options were designed to improve ergonomic use for caregivers.

An adjustable front tray to allow the user to eat, draw, and hold objects more easily. The pegs and adjustment brackets allow height, angle, and distance of the desk to all be adjusted. The desk also features an opening for additional attachments.

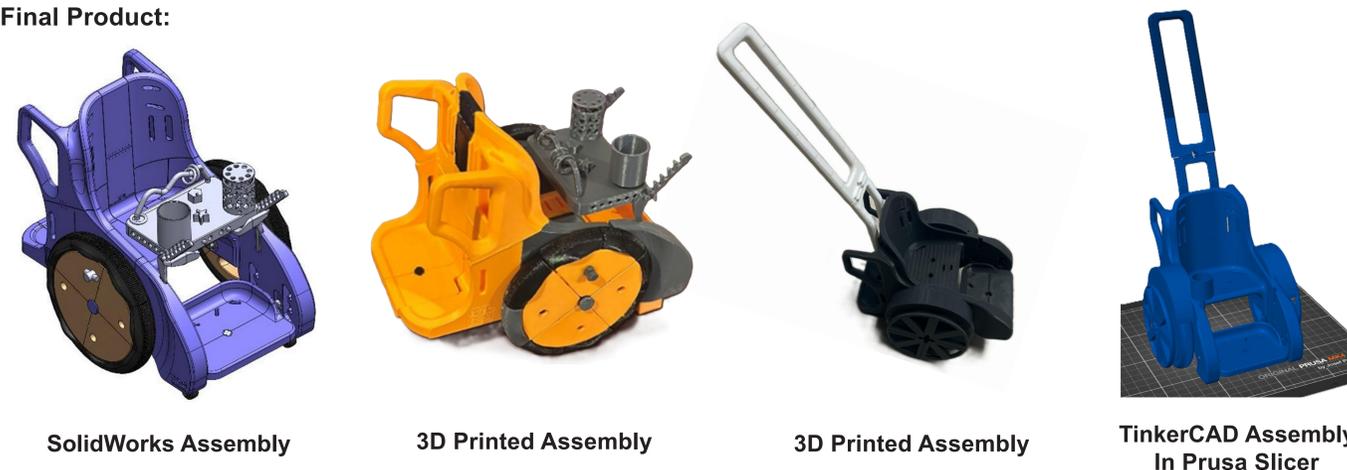
Enrichment Features:

A place to attach certain accessories for the wheelchair, like a cupholder or some kind of toy for the child to play with. Having a place to add accessories allows the individual to add whatever they desire to the wheelchair.

A cup holder, a pencil holder, shape inserts, and an interactive toy. As well as shape inserts that fill openings in the tray when attachments are not in use. They also function as a learning activity for toddlers. The wave-shaped toy with movable rings is designed to provide entertainment and support motor skill development.



Final Product:



METHODS

Modifications were selected from a large set generated in the brainstorming phase. This selection process relied on decision matrices to determine the most effective solutions for implementation. Selected designs were then modeled using SolidWorks, TinkerCAD, and Onshape to create and modify TMT components.

All parts were 3D printed using PLA on the University's Prusa MK4IS. Printing at a 1/4 scale introduced challenges in assembly due to small components and support material remnants. However, this approach allowed the full model to fit within limited print bed space. Assembly and alignment were tested using both CAD and the physical model.

CONCLUSIONS AND RECOMMENDATIONS

The original TMT design was successfully improved by enhancing safety, usability, and user engagement. These modifications have the potential to improve the daily experience of children using mobility devices. The project also provided valuable experience in applying teamwork, project management, design iteration, and problem-solving in a real-world context.

For future work, the design process should begin with a meeting with the intended user and their family to better understand user priorities. This would be especially beneficial given the number of possible modifications and the limited available space. Incorporating user input earlier in the process could reduce redesign time and improve the overall quality of the final product. These improvements highlight the importance of user-centered design in developing effective assistive devices.



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