GAIT TRAINER WITH TREADMILL

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Problem Statement

More than 25% of adults in the United States have a disability, 35 million of whom are women [1]. Even though it has been proven that daily physical activity can help reduce the impact of chronic diseases, improve mobility, reduce muscular atrophy and increase community involvement, less than half of all adults with disabilities engage in leisure time aerobic physical activity [2]. This is in part due limited resources and appropriate access to accessible aerobic exercise. This project focuses on developing a transfer system to allow a user and her gait trainer to move on and off of a standard treadmill.

Design Specifications

- Withstand the weight of the user, gait trainer, and staff
- Be slip-resistant to prevent falls
- Have safety guides on the side to prevent wheels falling off of the treadmill
- Have a smooth finish free of sharp edges
- Easily compact and be set up in under 5 minutes
- Be adjustable to other treadmills

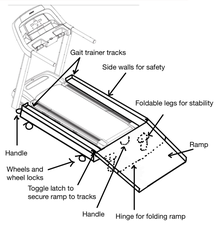

Figure 1. Preliminary design chosen based on design specifications

Background Information

Gait Trainer: An adjustable walking support device used in rehabilitation. It provides postural support and allows for a more natural gait pattern.

Client: Amanda Pajerski, OTR - Proposed this project on behalf of her patient.

Patient: A woman with a significant mobility impairment and seizure disorder seeking a more efficient system to exercise in the winter.

Impact: This device is designed to allow users to transfer on and off of a standard treadmill while using a mobility aid such as a gait trainer.

Existing Devices:

- Rifton Pacer Gait TR with Treadmill Base
  - Discontinued in adult models
- Rifton Pacer GT with the K640 Large Utility Base
  - Current model used by client
  - Base is incompatible with treadmill use
- 2012 Horizon T101 Treadmill

Figure 2. Rifton Pacer Gait Trainer with the K640 Large Utility Base [3]

Figure 3. Fall 2024 Design with client's Rifton Pacer Gait Trainer

References

[1] Centers for Disease Control and Prevention. "Supporting women with disabilities to achieve optimal health." CDC.gov. Accessed: Oct. 6, 2025. [Online.] Available: https://www.cdc.gov/womens-health/features/women-disabilities.html

[2] Centers for Disease Control and Prevention. "Increasing physical activity among adults with disabilities." CDC.gov. Accessed: Oct. 7, 2025. [Online.] Available: https://www.cdc.gov/disability-and-health/conditions/physical-activity.html.

[3] Rifton. "Pacer Gait Trainer K640 Large Pacer." Rifton.com. [Online.] Available: https://www.rifton.com/products/pacer-gait-trainers/pacer-gait-trainer-k640

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[5] K. H. Mackes and D. L. Lynch, "The effect of aspen wood characteristics and properties on utilization," in Sustaining Aspen in Western Landscapes: Symp. Proc., W. D. Shepperd et al., Compilers. Fort Collins, CO, USA: U.S. Dept. Agric., Forest Serv., Rocky Mountain Res. Station, 2001, Proc. RMRS–P–18, pp. 429–440.

[6] EZ-ACCESS. "The Lifespan of an Aluminum Ramp: What to Expect." EZ-ACCESS.com. Accessed: Nov. 29, 2025. [Online.] Available: https://ezaccess.com/blogs/main-blog/the-lifespan-of-an-aluminum-ramp-what-to-expect

Final Design

Design Features:

- Adjustable legs on the bottom of the side-tracks
- Adjustable supports in the front and back of the side-tracks that allow horizontal spacing changes
- Prefabricated ramp with wheels for easy storage
- Non-slip and scratch resistant material on the bottom of the ramp

Usage:

- Adjustable legs on sidetracks set at a height that is tight-fit with the treadmill
- 80/20 aluminum supports adjusted to correct horizontal positioning of sidetracks
- Ramp rolls on and off and rests on the baseboards of the sidetracks
- Ergonomic mobility of the ramp by wheels and side handles

Final Cost: $533.22 **Projected Final Cost:** $667.13

Figure 4. Final design with the gait trainer on the treadmill

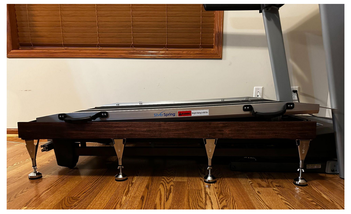

Figure 5. Final design in the storage position

SolidWorks Testing and Results

Model Analyzed:

- 1703 N load to simulate maximum expected weight from user
- Adjustable legs and treadmill support body: 1020 CD Steel
- Sidetracks base: pine wood

Displacement Results:

- 13.7 µm maximum displacement

Factor of Safety Results:

- 25.7 minimum FoS
- 43.8 kN maximum load

Discussion:

- Maximum displacement is minimal
- Minimum FoS significantly exceeds recommended values [4]
- Likelihood of failure is low

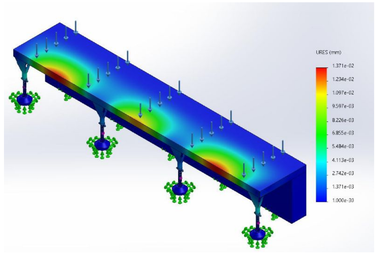

Figure 6. SolidWorks displacement results for side tracks testing under 1703 N load.

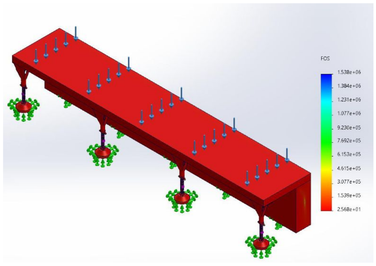

Figure 7. SolidWorks FoS results for side tracks testing under 1703 N load.

Acknowledgements

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Stability Testing and Results

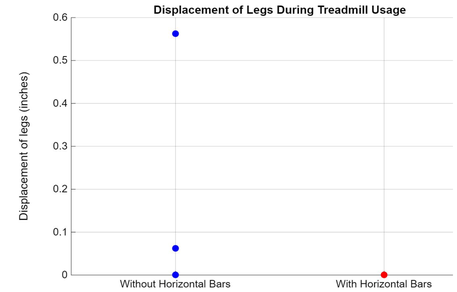

Figure 8. Displacement of side rail legs during device use

- Measuring displacement of side track legs on the floor when device is in use
- Slight movement when side tracks not attached to each other or the treadmill
- Horizontal attachments between side tracks increase overall stability and decrease movement of side tracks to having no visible displacement

Ease of Use Testing and Results

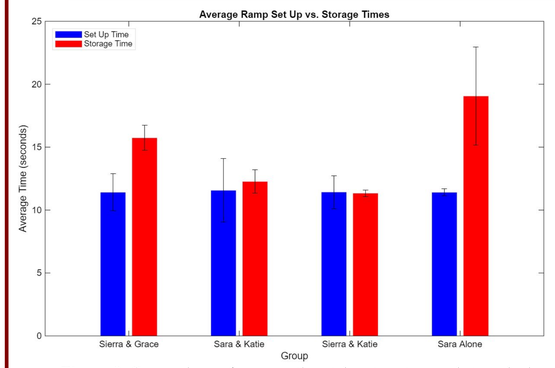

Figure 9. Comparison of average time taken to set up and store device

- Average time to set up ramp for use was consistent across trials (approximately 11 seconds)
- Average time to put ramp in storage position was higher when done by only one person
- Device can easily be set up and taken down in under 5 minutes

Discussion

Strengths:

- Set up and take down of the ramp is fast and simple, adhering to the specifications in the PDS
- The ramp is adjustable in both height and width to accommodate different treadmills

Weaknesses:

- Wood can become warped over time, which could make the device unsafe [5]
- The SolidWorks testing uses an ideal version of the material and does not take into account the natural degradation of the materials used in the design

Ethical and Safety Concerns:

- The wood tracks and metal ramp are durable, making this device reusable and able to withstand the necessary forces for an operating life of at least 15 years [6]
- There is no locking mechanism for the ramp when in use; in testing the ramp did not shift, but with an abnormal and large backward force there could be slippage

Future Work

- Improve the material of side tracks to a durable yet lightweight wood alternative
- Create a system to remove the side tracks easily after each use to minimize the space taken up while in the storage position
- Make a way to lock the ramp to the side tracks when in use