

Caitlyn Christopher¹, Sarah Cooney¹, Rory Klingensmith¹, Garrett White¹, Gregory Connors², Romina Garanki², Faith Kean², Tan Tran², Amged Eidelsafy², Ellie Wood², Dr. Adrian Shieh³, Dr. Kelly Heath³
Drexel University School of Biomedical Engineering, Science and Health Systems¹; Drexel College of Medicine²; University of Pennsylvania³

Medical Need

- 1 FOOT DEFICIT FROM DIABETES**
50% of 50+ diabetic patients
HIGH severity
- 2 ANKLE FRACTURE/SPRAIN**
680,000 patients between
2012 - 2016
MODERATE severity
- 3 ACHILLES TENDON TEAR**
106 per 100,000 patients
HIGH severity



Existing Solutions

The Kneeler



Kneeler Limitations

- Lack of hip mobility
- Complicated installation
- Expensive
- Lack of padding = discomfort & pain
- Over-padding = leg slipping

Other Existing Solutions



Objective

Assistive walking device that allows for:

1. Non-weight-bearing
2. Affordability
3. Controlled mobility

Improves on other existing solutions with:

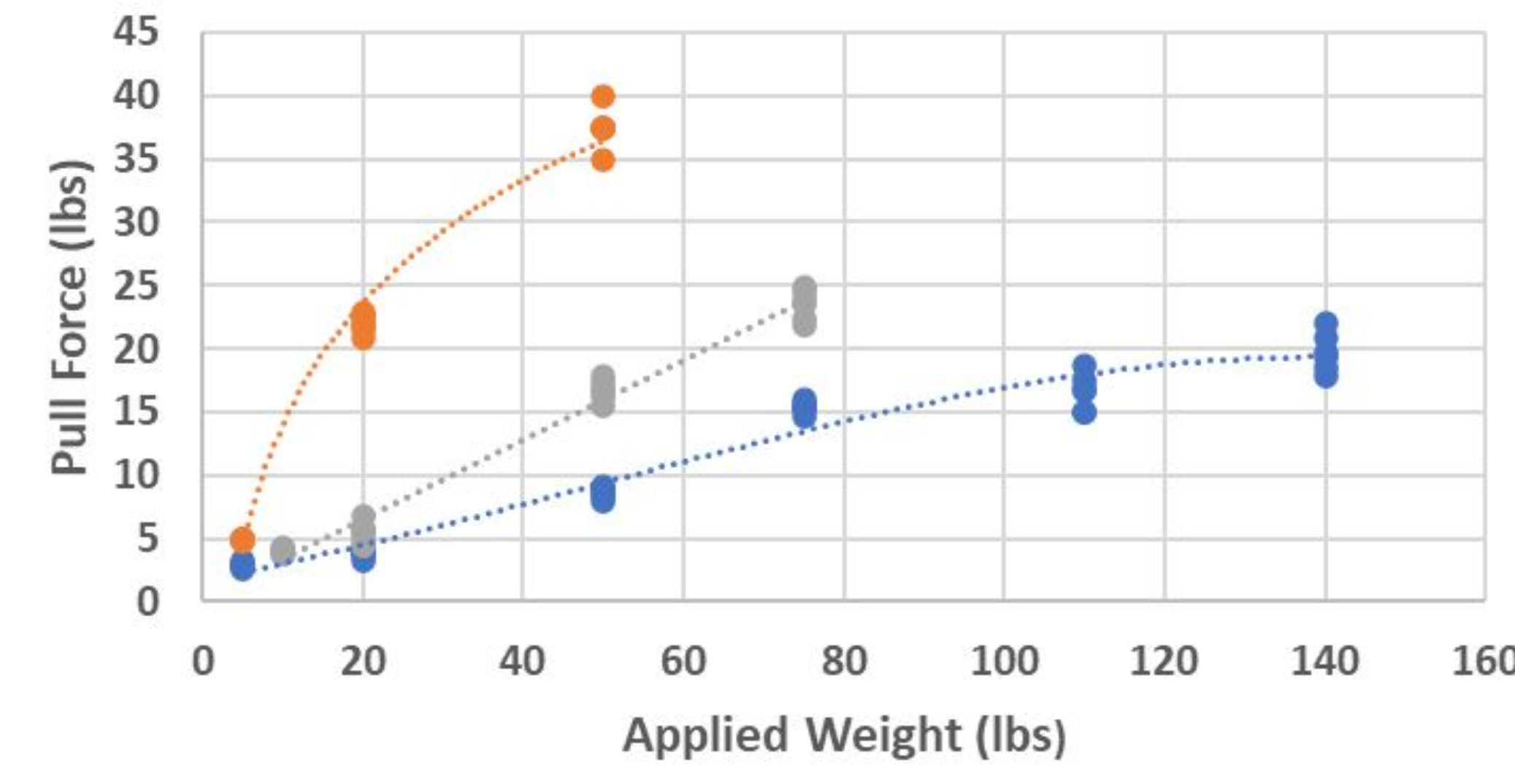
1. Stability & control
2. Mobility
3. Ease of use

Results

Component Testing

- Top orientation best suited for track roller
- Withstand 140 lbs (V1 will test to 230.4 lbs)
- Comparing efficacy of single & double rail for ROM & interference with healthy leg

Force to Pull Slider with Weights



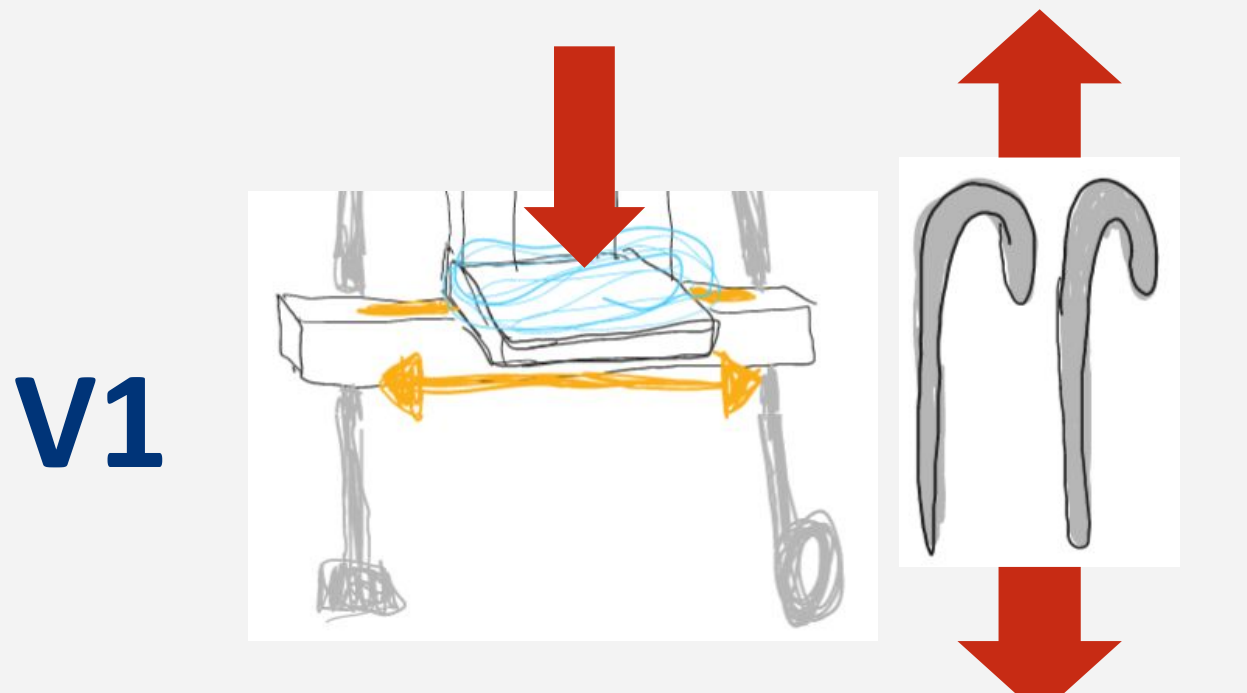
Results for V1, V2, V3 to be obtained

Solution

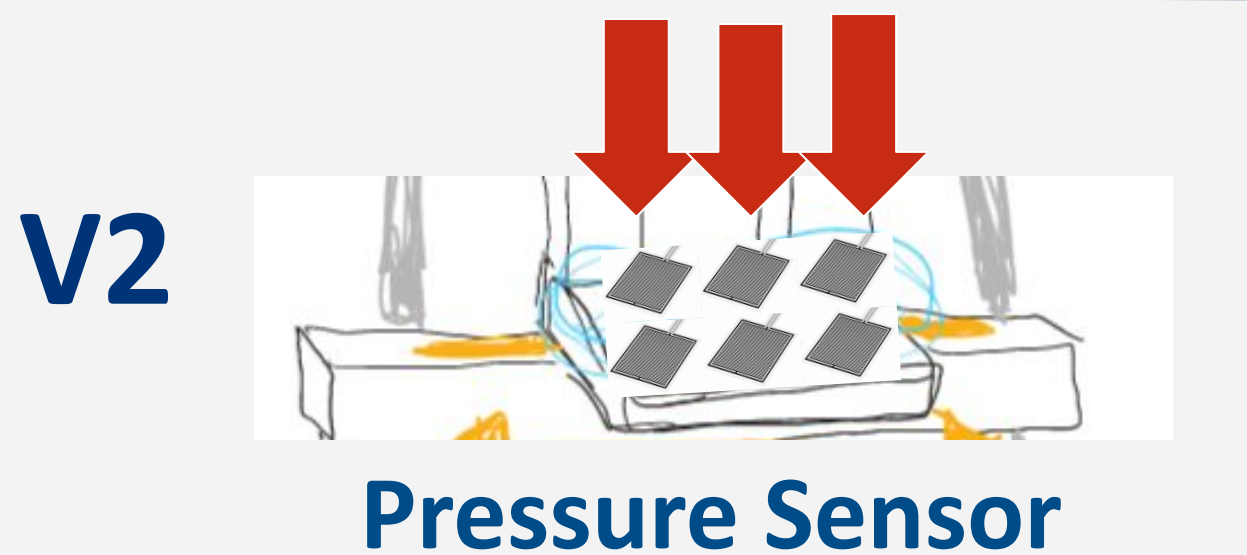
Component Testing:

- Weight applied on top or side?
- Single or Double Rail?

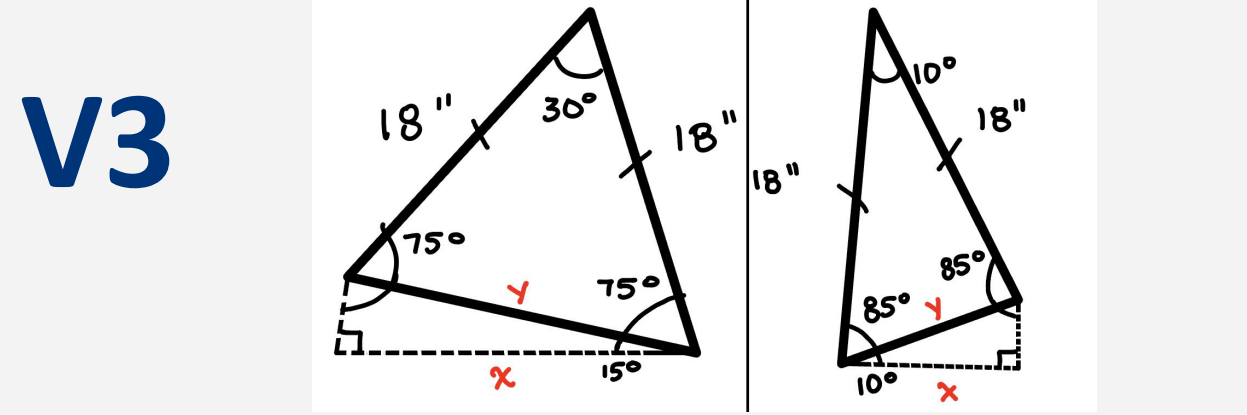
Verification Testing:



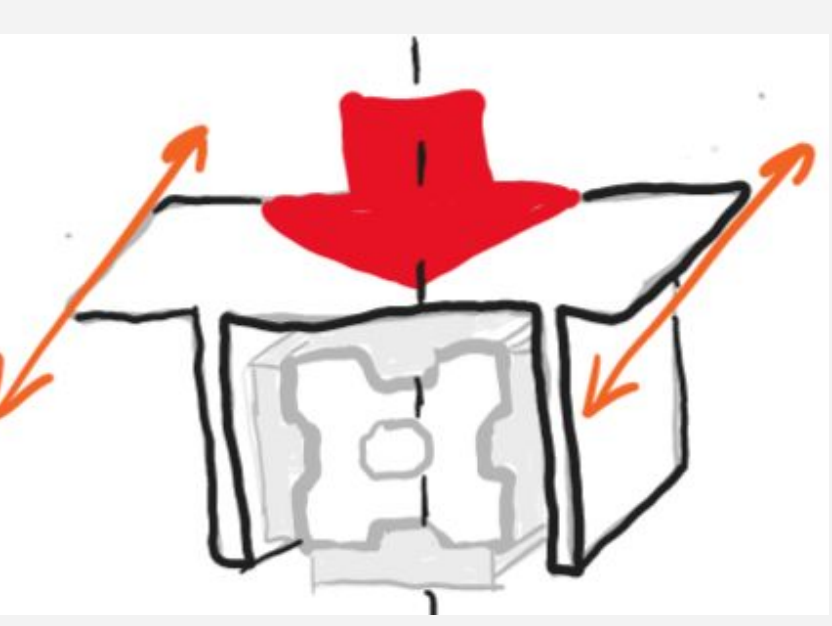
Compression and Tension



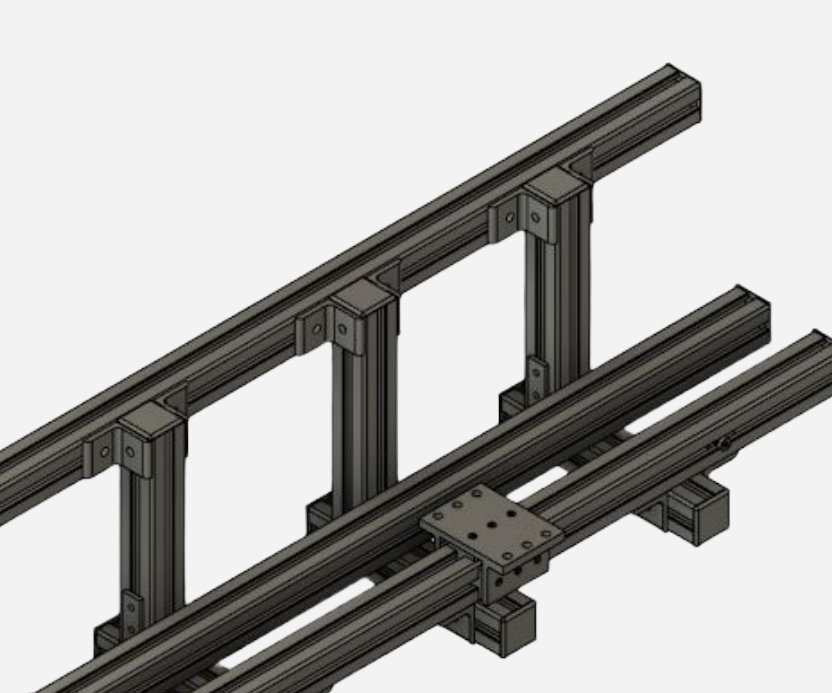
V3



Hip ROM Testing in Gait Lab



Weight on Top



Single Rail or



Double Rail

Walker with Embedded Slider (Left leg use)



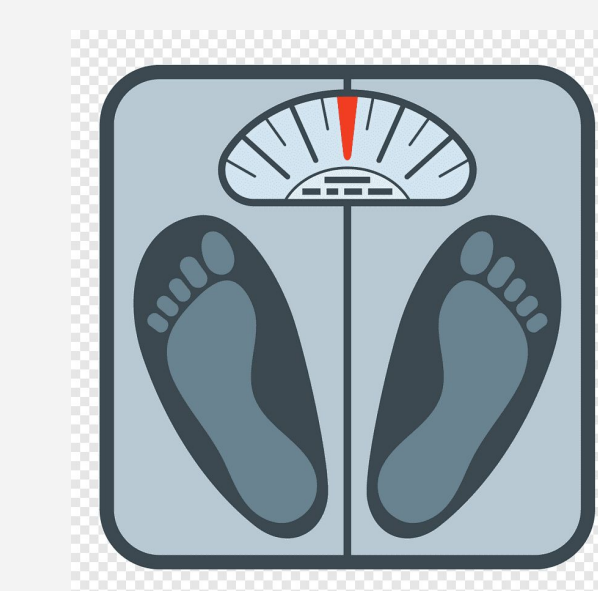
Features:

- Non-weight-bearing
- Holds patient population's weight
- Dynamic for walking
- Comfortable

Constraints

Size	Fits any walker's dimensions
Adjustable	Fits any patient's leg dimensions
Cost out-of-pocket	Max Price: \$230 (price of Kneeler)
Reversible	Either leg (right or left side of walker)
Safety	No falls/slips, boundaries for A-P motion
Ease of Use	Easy assembly, attachable to any walker

Requirements



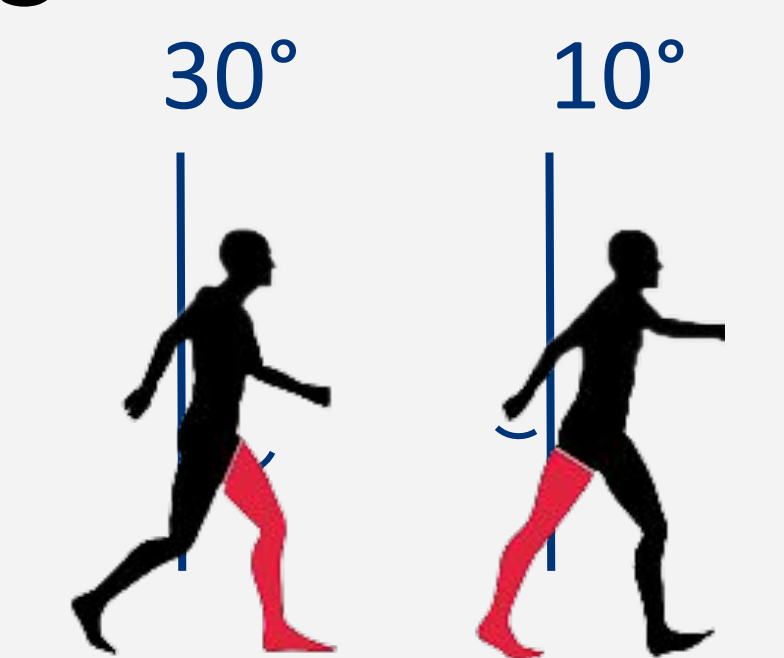
R1

168 - 230.4 lbs
Hold patient pop. weight



R2

<4,400 Pa
Prevent pressure ulcers



R3

No significant difference in Hip ROM

Impact

- Prevent further injury aggravation & hip atrophy
- Maintain mobility while walking
- Ease financial burden (TBD)

Conclusion and Next Steps

- Further component testing to determine # of rails
- Verification testing (V1, V2, V3)
- Cost analysis

Acknowledgments

Dr. A. Shieh, Dr. J. Dougherty, & Drexel University, Dr. K. Heath, Dr. T. Redenski, & Penn Medicine, DrExcel Health, ASTM International