

CREATING ADAPTIVE TECHNOLOGY TO PLAY THE PIANO

Taylor Lamberty, Myranda Schmitt, Nyna Choi, Jolene Enge
 Clients: Vicki Janisch, Mary Advisor: Dr. Willis Tompkins

ABSTRACT

Mary's passion is playing the piano. Both of her ankles have little to no flexion, which prevents her from using the damper pedal that is necessary to create a rich, full sound. Some current adaptive devices exist, but are not ideally suited to our client's greatest need of portability. Our device features a simple design that utilizes a wedge to actuate the pedal. Through modification, we were ultimately able to achieve a compact, low profile, lightweight device that is portable and is easy to use.

INTRODUCTION

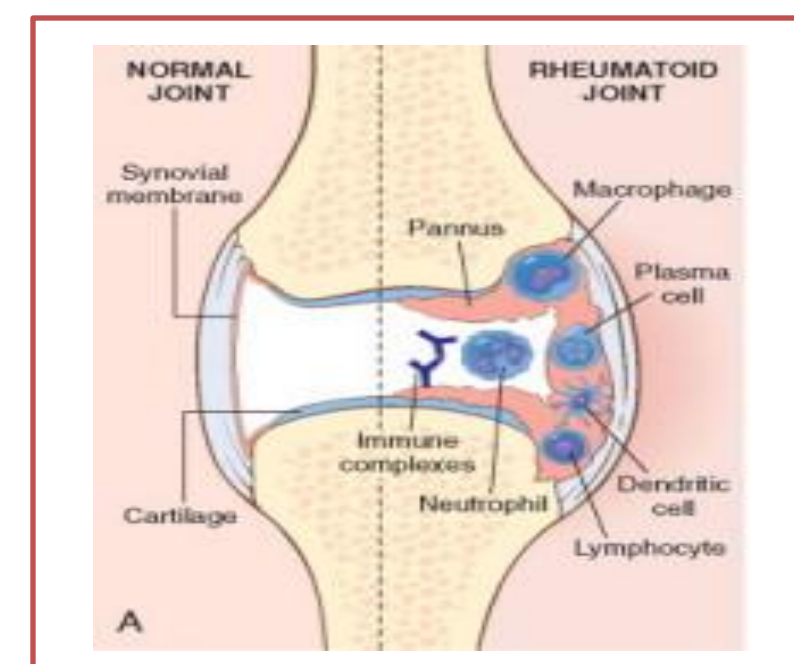
Mary

- A Wisconsin farmer and client of AgrAbility of Wisconsin
- Loves to play piano, but is unable to use the damper pedal
- Two knee replacements, fused left ankle, right leg below-the-knee amputation all due to rheumatoid arthritis

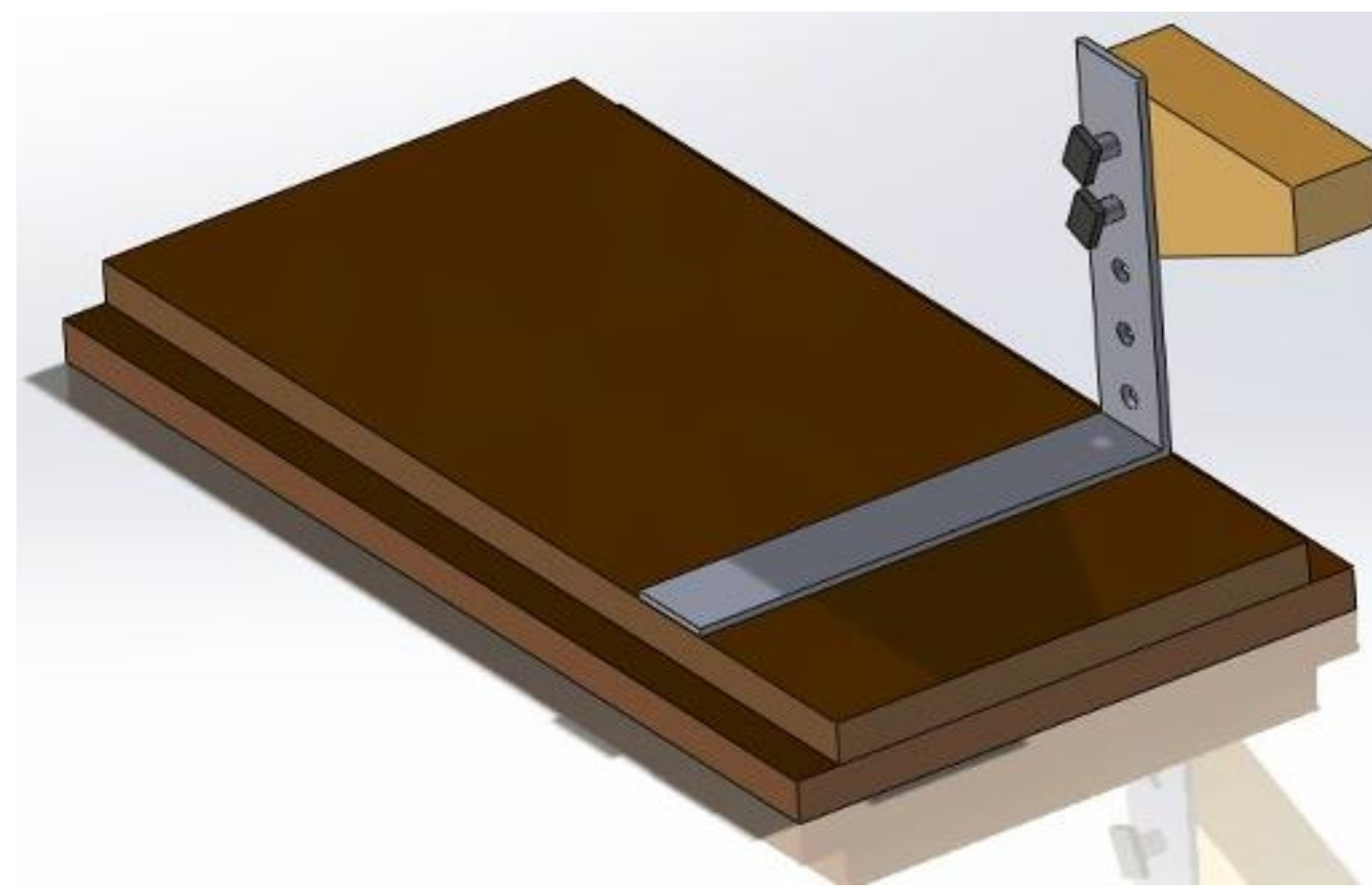


Rheumatoid Arthritis

- A chronic, systemic, inflammatory disorder
- 1.5 million Americans have rheumatoid arthritis [1]
- Painful condition that can lead to joint deformation [2]



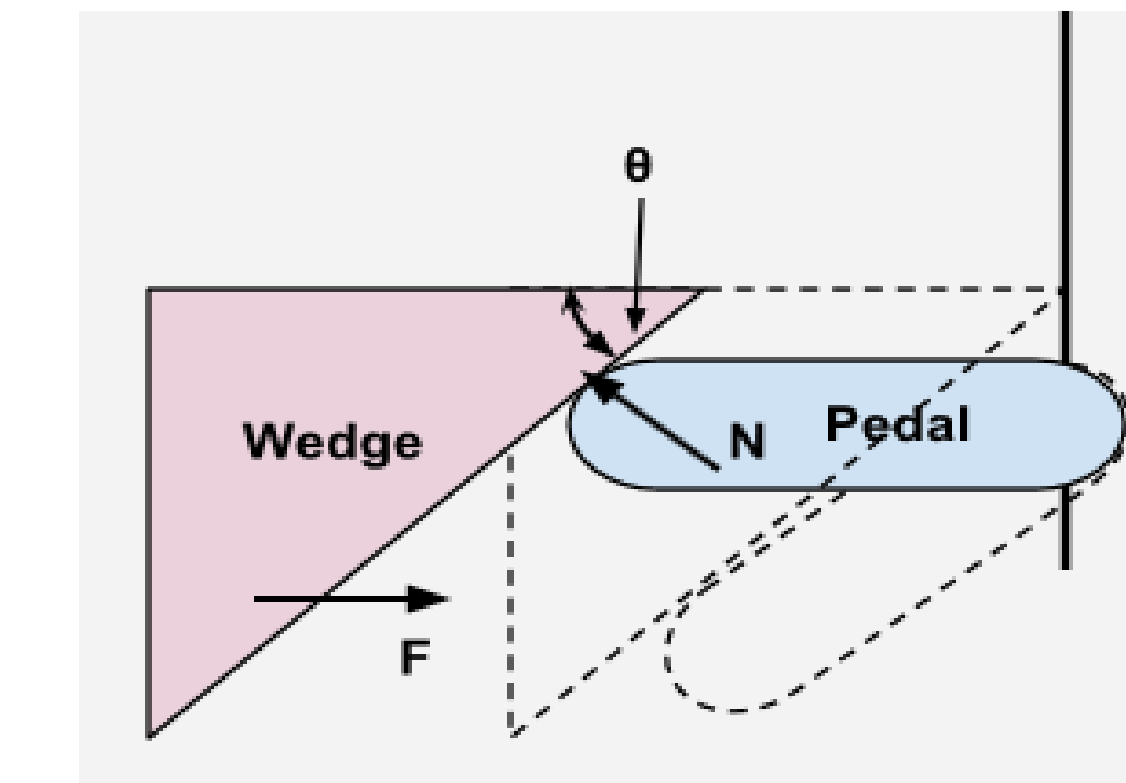
FINAL DESIGN



- It was the third device constructed.
- Gliding platform
- Off-set wedge
- Wedge at 25 degrees
- Wood
- Adjustable wedge height
- Max height off ground = 4.5"
- Min height off ground = 3"
- Half inch increments of adjustability
- Toe stopper
- Anti-slip tape to prevent slippage
- Teflon on wedge
- Anti-skid tape on bottom of device
- Felt to protect piano
- Velcro to prevent gliding during transportation
- Modifications based on Mary's feedback



DISCUSSION



$$F_{\text{downward}} = F \cos\theta$$

- Wood/metal/plastic
- Adjustable
- Flexion/extension sliding
- Budget:**
- Under \$200 limit
- Most expensive = sliders

Limitations:

- Budget
- Communication with Mary



FUTURE WORK

- Improved portability
- Actuate all piano pedals
- Aesthetically pleasing
- Actuate organ pedals
- Improved sturdiness
- Bag for transportation

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- Michel VanLoon
- Vicki Janisch
- Mark Mieves, PT
- Ward Brodt Music
- Mary
- Bruce Lamberty

References:

- 1) Centers for Disease Control and Prevention. Rheumatoid arthritis. <http://www.cdc.gov/arthritis/basics/rheumatoid.htm>
- 2) Robbins, S. L., Kumar, V., & Cotran, R.S. (2010). Robbins and Cotran pathologic basis of disease.

DESIGN CRITERIA

- Lightweight and portable
- Compatible with multiple piano models
- Functions without needing ankle flexion
- Able to withstand repetitive force application
- Affordable – under \$200.00 budget
- Minimal energy requirement and easy motion to activate

TESTING

- Mary lives 50 miles away, so we were only able to test it twice.
- Prototypes were sent to Mary. She tested them and sent us feedback.

Prototype #	Problem	Fix
1	-Platform too tall -Angle of knee	-Lowered platform 2"
2	-Platform still too tall -Distance from piano too great for comfortable playing	-Lowered platform 1" -Placed wedge to the side

