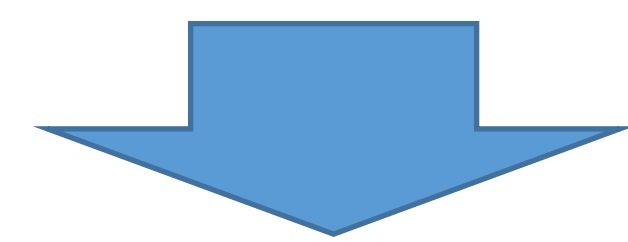


Motivation / Objective

Motivation

- C5-C8 patients need arm rehabilitation.
- Cornhole aids arm rehabilitation therapy.

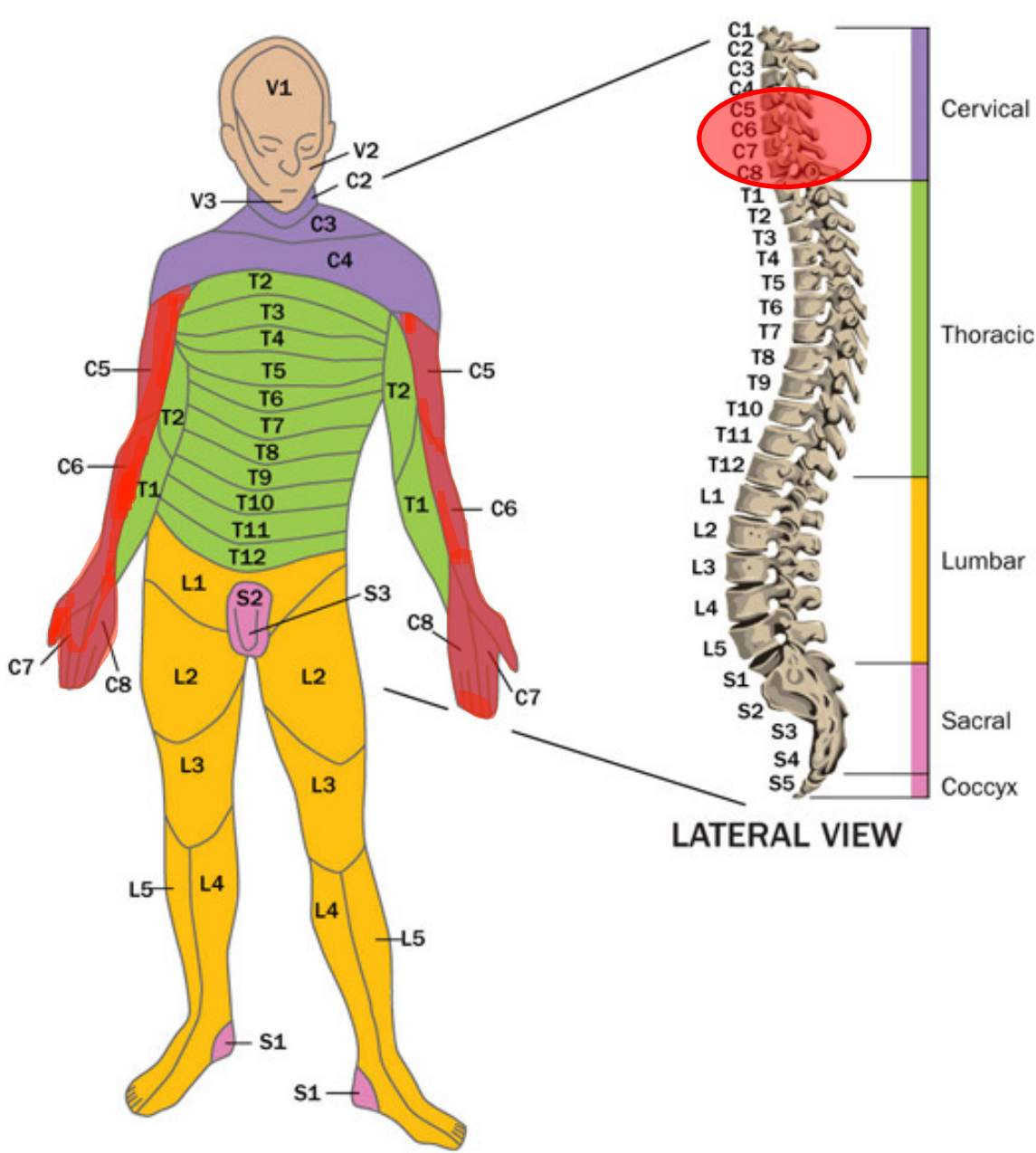


Objectives

- Develop devices to assist cornhole play.



Target Users



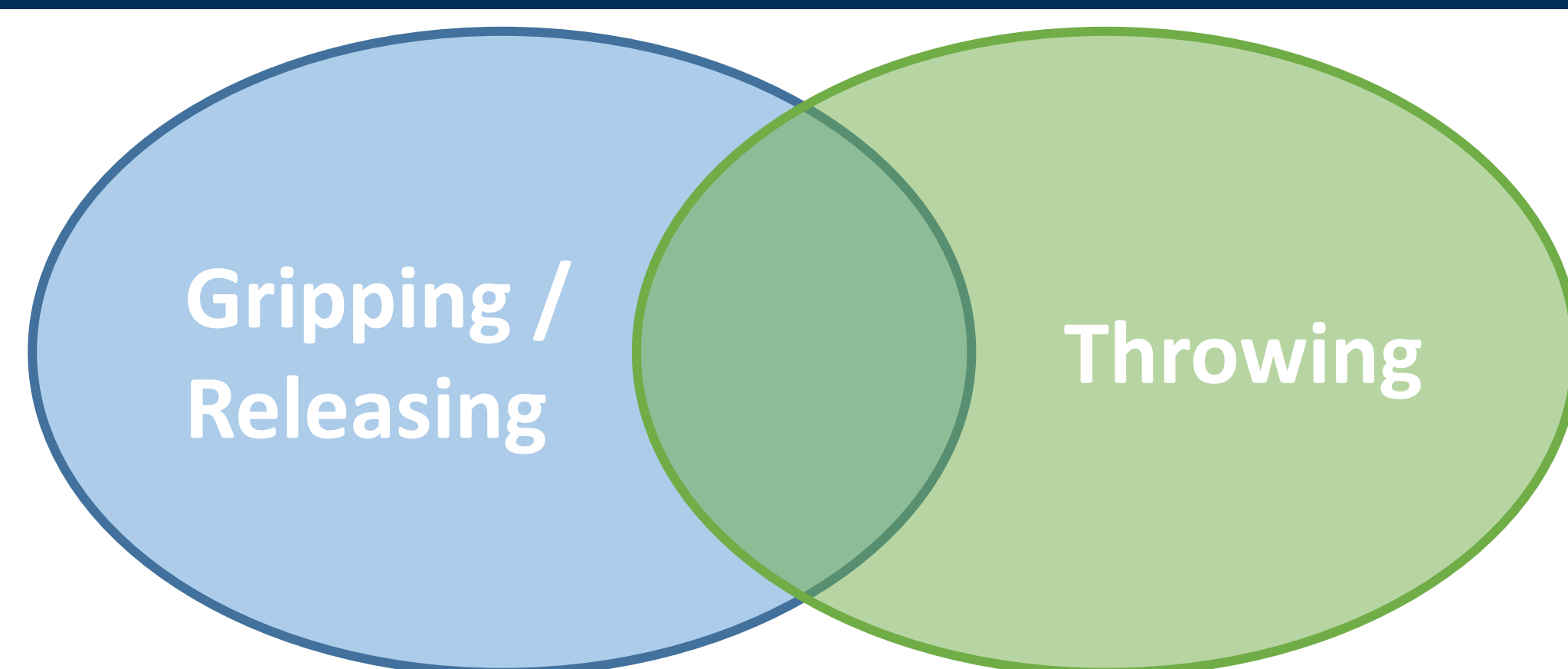
Low-Cervical Nerves (C5-C8) injury

- C5 – Shoulder Abduction
- C6 – Elbow Flexion / Wrist Extension
- C7 – Elbow Extension / Wrist Flexion
- C8 – Finger Flexion

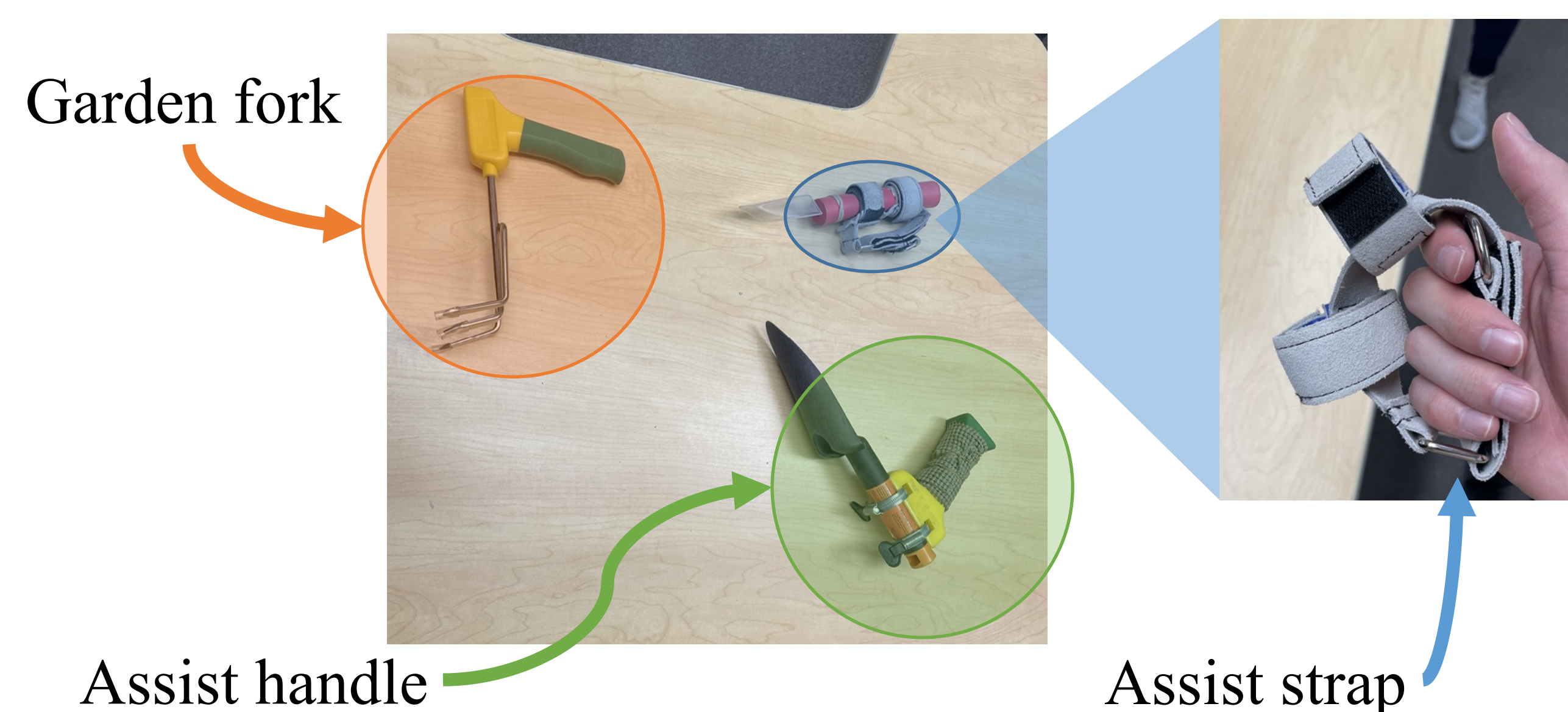
Ages of 16-60

- The range of ages accounts for the broad spectrum of which SCI can occur in both males and females.

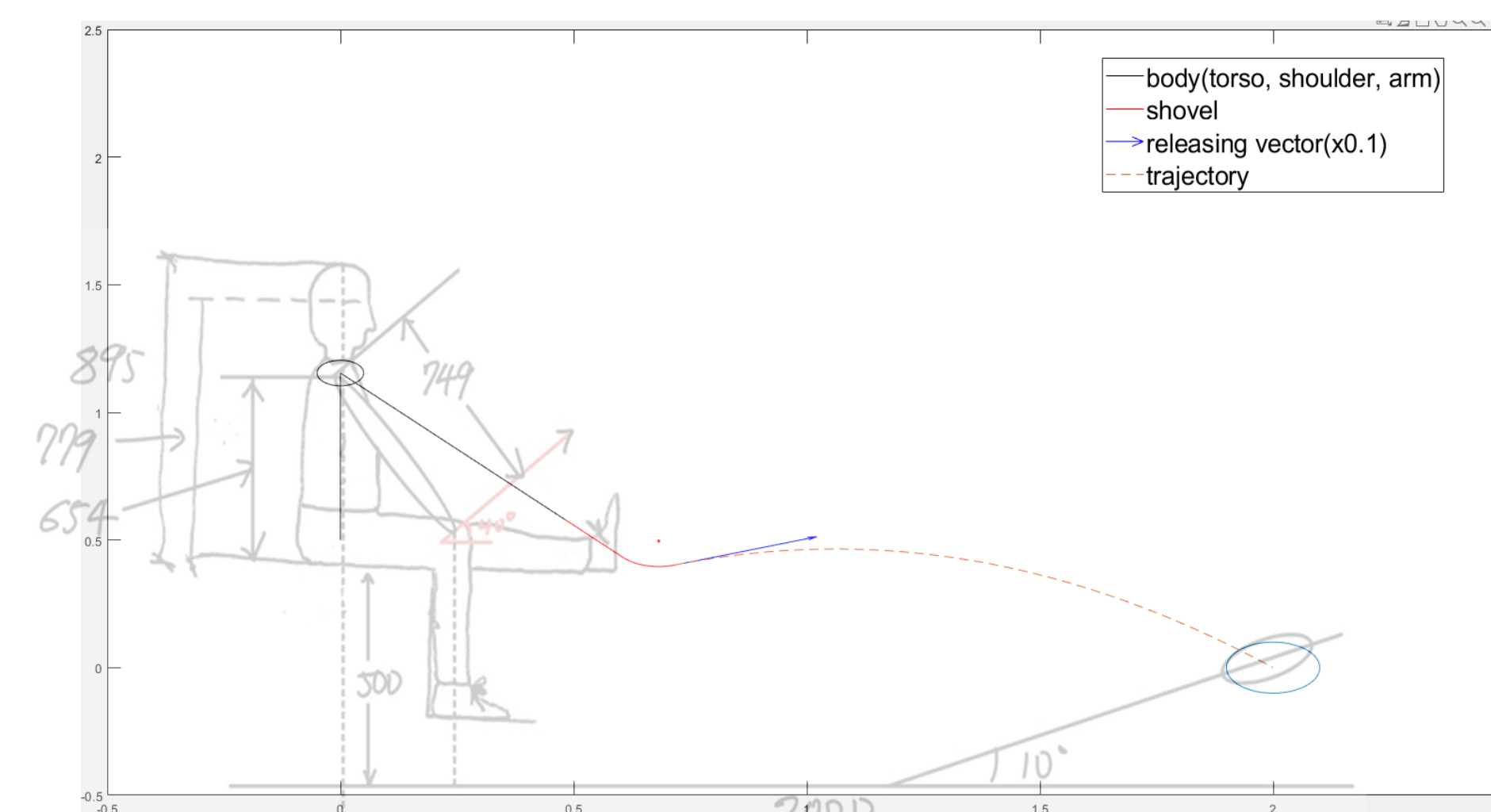
Main Functions to Support



Current Equipment for Physical Therapy



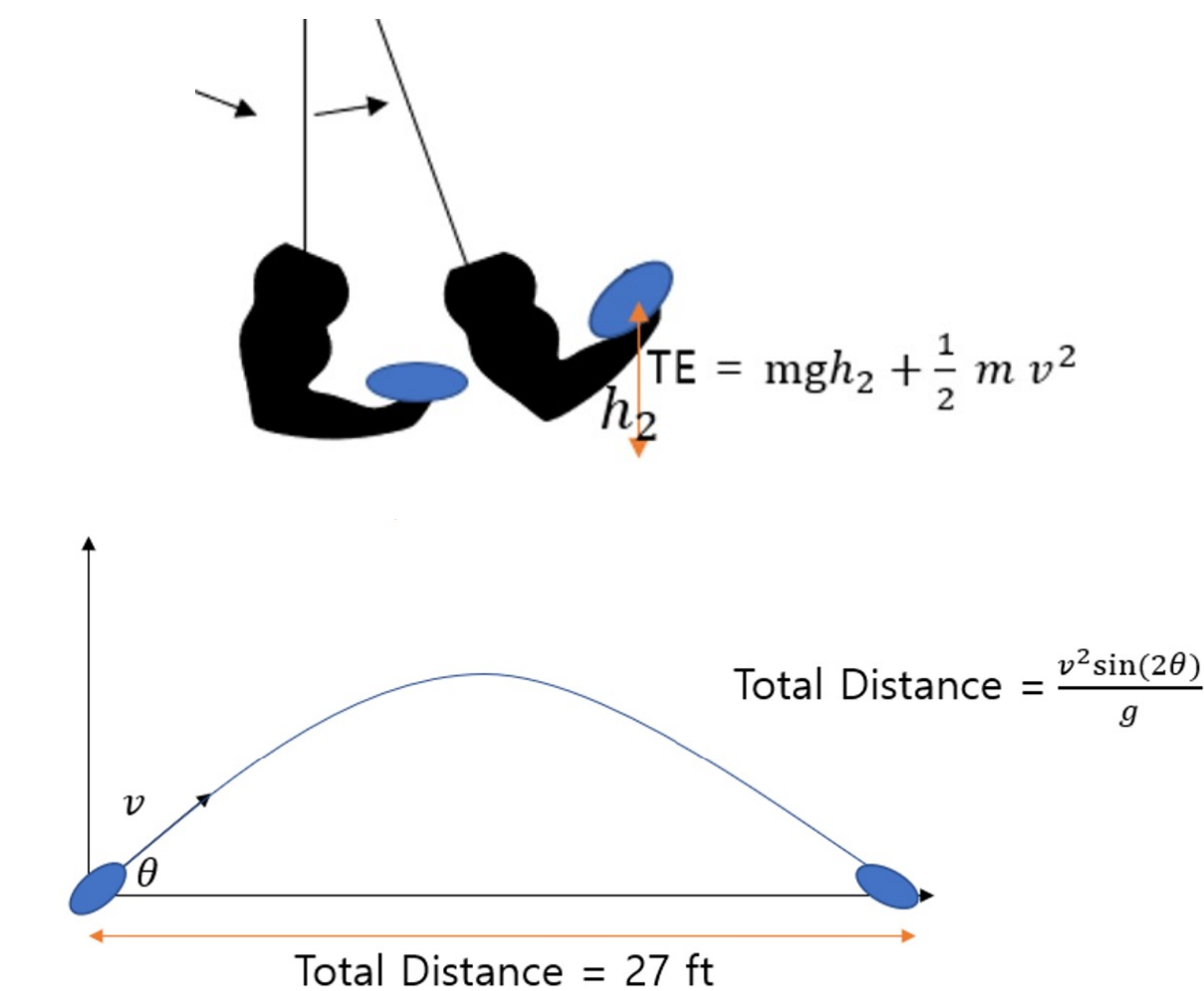
Calculations/Math behind the product



Shovel Design Calculation

- $y - y_0 = v \cdot \Delta t \cdot \sin \theta - 9.81 \Delta t^2$
- $x - x_0 = v \cdot \Delta t \cdot \cos \theta$
- $\sum KE + \sum PE = \text{constant}$

Input:
• Target Distance : 10 ft
• Launching angle(arm) : 40°
• Shovel angle : 60°
Output:
• Can release bag? : True
• Can hold bag at initial? : True



External Device Design Calculation

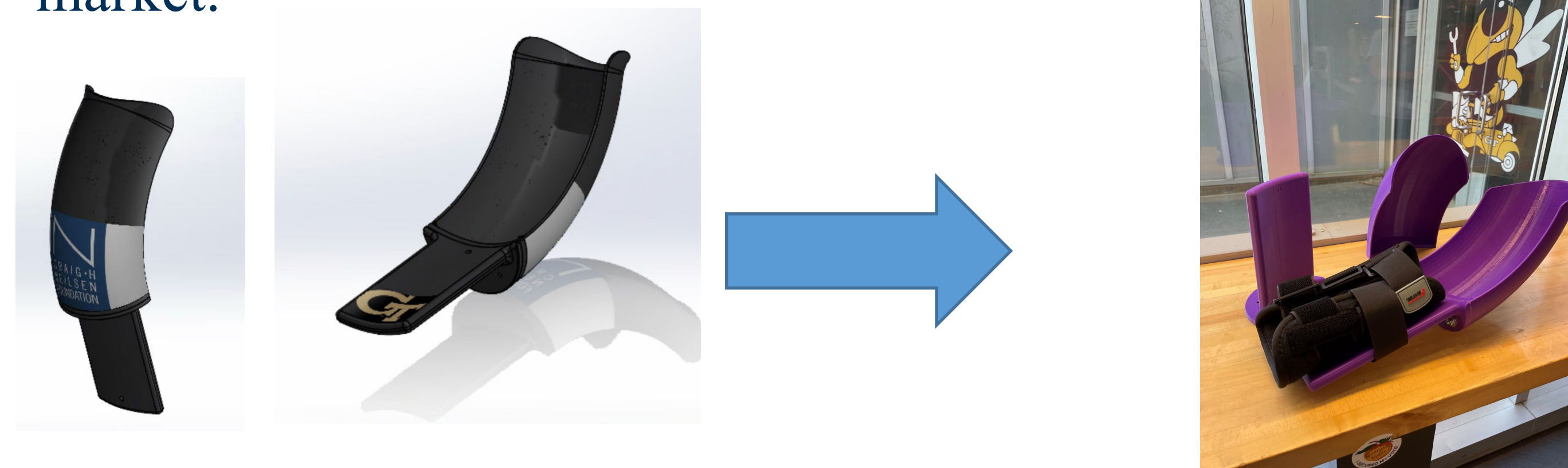
$$V \cos \alpha = \frac{V \sin \alpha + \sqrt{(V \sin \alpha)^2 + 2gh}}{g}$$

The torque needed to achieve exit velocity is 54.7 Nm.
Average men push strength at 1.3 m: 306.927 N
Average women push strength at 1.3m: 222.41 N
Approx. Half the average push strength needed to launch a cornhole bag is 10 ft.

Product

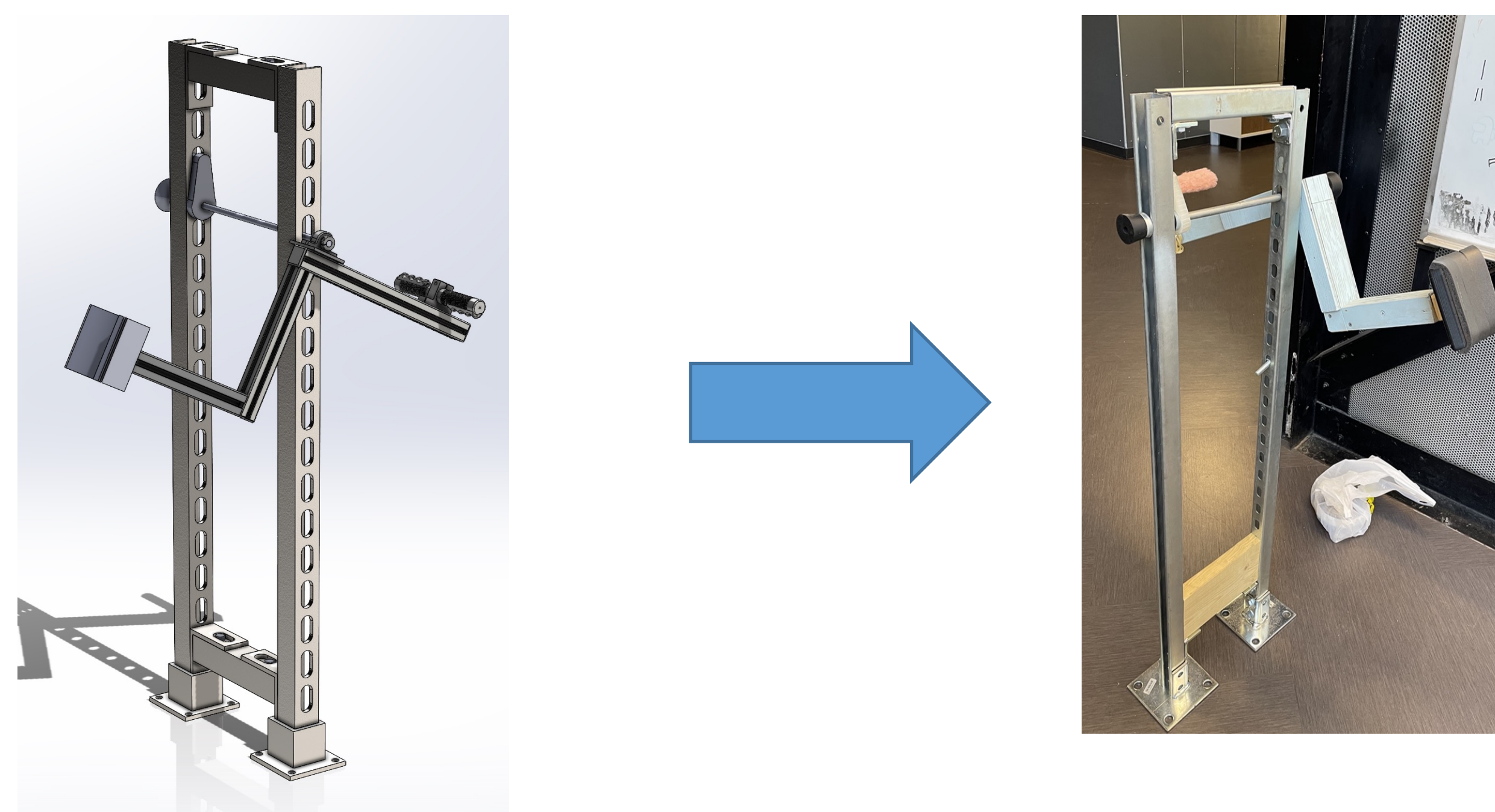
Shovel Device

- Allows user to hold and throw the bag without using their hands/wrists
- It can be comfortably worn with the use of a brace that is available in the market.



External Device

- Assists user who lack the strength/control in their upper arm to throw the bags
- The height is adjustable to accommodate the user's physical condition.



Price/Marketability



Affordable/~\$150



Transportable



Pleasing and aesthetic



Easy to use

Results/ Impacts

Results

Patient was able to successfully and effectively play the game of cornhole using the products provided

Impacts

Let the patient play the game, allowing them to participate in an activity that was difficult or even impossible before.



Future Applications

Sports

Can be used to play other sports that involve throwing a projectile (baseball, softball, etc.)

Two

Promotes independence in therapy sessions by utilizing new movements

Three

Can be used for daily activities that require gripping and throwing applications

Disclaimer / Thanks

We extend our special thanks to Hallie Wright, a therapist at the Spinal Cord Injury Unit of Shepherd Center, for her valuable contributions to this project.