ME 440W, Section 6: Fresh Start Wellness

Overview

Due to muscle atrophy, 1 in 3 people over the age of 65 falls each year. A person is taken to the emergency room every 17 seconds due to a fallen accident and the United States spends $20 billion each year in care for fallen injuries. The elderly population does not have access to an in-home leg exercise machine that will increase leg strength and reduce the risk of injury.

Objectives

The goal is to design a portable, inexpensive leg press machine that will assist in strengthening the quadriceps muscles of the geriatric population. The device should:

- Support a full range of motion (12 to 18 inches)
- Function at multiple inclination angles
- Have interchangeable weight loads with a maximum weight of 100 pounds
- Include a handle for easier mobility

Approach

- Our sponsor, an experienced physical therapist, provided us with the specific requirements and informed us of what would benefit her clients, majority of whom being nursing home residents.
- The team performed an extensive patent search and also researched the existing products on the market, realizing that there is a need for this type of product.
- Five concepts were created and compared using the selection matrices. One design was selected.
- An experiment was done with the elastic bands (used for weight load) to determine their resistance.
- A CAD model was created for the prototype and finite element analysis was conducted on the foot platform to determine if the material will yield at the maximum weight load.
- A friction analysis was done to determine if the machine will slide while being used.
- A physical prototype was constructed and tested to see if it met the design requirements.
- The prototype met the basic requirements of the project, but the design can be modified so that it can be easier to operate and increase portability.

Outcomes

- Our sponsor will take the prototype to a nursing home and see how the product functions with its target audience. Our sponsor is hoping to get a patent approved and will begin selling it once few design improvements are made.